KNOWLEDGE MANAGEMENT CAPABILITIES AND ORGANIZATIONAL PERFORMANCE: AN INVESTIGATION INTO THE EFFECTS OF KNOWLEDGE INFRASTRUCTURE AND PROCESSES ON ORGANIZATIONAL PERFORMANCE

BY

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DISSERTATION

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Abstract

Knowledge is one of the most important assets for surviving in the modern business environment. The effective management of that asset mandates continuous adaptation by organizations, and requires employees to strive to improve the company's work processes. Organizations attempt to coordinate their unique knowledge with traditional means as well as in new and distinct ways, and to transform them into innovative resources better than those of their competitors. As a result, how to manage the knowledge asset has become a critical issue for modern organizations, and knowledge management is considered the most feasible solution. Knowledge management is a multidimensional process that identifies, acquires, develops, distributes, utilizes, and stores knowledge. However, many related studies focus only on fragmented or limited knowledge-management perspectives. In order to make knowledge management more effective, it is important to identify the qualitative and quantitative issues that are the foundation of the challenge of effective knowledge management in organizations.

The main purpose of this study was to integrate the fragmented knowledge management perspectives into the holistic framework, which includes knowledge infrastructure capability (technology, structure, and culture) and knowledge process capability (acquisition, conversion, application, and protection), based on Gold's (2001) study. Additionally, because the effect of incentives − which is widely acknowledged as a prime motivator in facilitating the knowledge management process − was missing in the original framework, this study included the importance of incentives in the knowledge management framework. This study also identified the relationship of organizational performance from the standpoint of the Balanced Scorecard, which includes the customer-related, internal business process, learning & growth, and perceptual financial aspects of organizational performance in the Korean business context.

Moreover, this study identified the relationship with the objective financial performance by calculating the Tobin's *q* ratio. Lastly, this study compared the group differences between larger and smaller organizations, and manufacturing and nonmanufacturing firms in the study of knowledge management.

Since this study was conducted in Korea, the original instrument was translated into Korean through the back translation technique. A confirmatory factor analysis (CFA) was used to examine the validity and reliability of the instrument. To identify the relationship between knowledge management capabilities and organizational performance, structural equation modeling (SEM) and multiple regression analysis were conducted. A Student's *t* test was conducted to examine the mean differences.

The results of this study indicated that there is a positive relationship between effective knowledge management and organizational performance. However, no empirical evidence was found to suggest that knowledge management capabilities are linked to the objective financial performance, which remains a topic for future review. Additionally, findings showed that knowledge management is affected by organization's size, but not by type of organization. The results of this study are valuable in establishing a valid and reliable survey instrument, as well as in providing strong evidence that knowledge management capabilities are essential to improving organizational performance currently and making important recommendations for future research.

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Definition of Terms

Knowledge: Knowledge is a multifaceted concept with multilayered meaning (Nonaka, 1994). Knowledge can be viewed as a state of mind, an object, a process, a condition of having access to information, or a capability (Alavi & Leidner, 2001). Moreover, it means not only know-how, but also know-why, know-what, know-who, know-where, and know-when. Knowledge can be essentially divided into two forms: tacit and explicit (Collison & Parcel, 2004).

Tacit Knowledge: Tacit knowledge is personal knowledge based on individual experience, action, commitment, and involvement in a specific context (Noe, 2002; Nonaka, 1994). It is difficult to articulate, express, and formalize to others, so it is often transmitted to others in informal and subtle ways.

Explicit Knowledge: Explicit knowledge is often categorized as codified or visualized knowledge, which is transmitted in the form of formal and systematic language (Nonaka, 1994). It is often referred to as information.

Knowledge Management: Knowledge management can be a work process or activity (Carvalho & Ferreira, 2001; Frappaolo, 2006; Milam, 2005), a technology infrastructure (Chinowsky & Carrillo, 2007; Hansen et al., 1999; Iftikhar, 2003), or an organizational culture to manage valuable corporate assets and knowledge (Chong et al., 2000; Pauleen et al.,

2007). Knowledge management is also difficult to define and measure because it is complex, multidimensional, and process-oriented.

Knowledge Management Capabilities: The definition of knowledge management capabilities is an organization's capacity or routine to recognize, create, transform, and distribute knowledge. It may be divided into two aspects: knowledge infrastructure capability and knowledge process capability (Gold, Malhotra & Segars, 2001).

Knowledge Infrastructure Capability: Knowledge infrastructure capability refers to the infrastructural environment, either information technology (IT) or non-IT, which supports knowledge creation and sharing capabilities (Carrillo et al., 2003). It includes concepts of technology, organizational structure, organizational culture, and the incentive system (Evaristo, 2005; Gold et al., 2001; Suresh & Mahesh, 2006).

Knowledge Process Capability: Knowledge process capability typically means the capability to obtain new and necessary knowledge, as well as to maintain it effectively to support employees' efforts to work better (Grant, 1996; Khalifa & Liu, 2003). It includes issues of acquisition, conversion, application, and protection of knowledge.

Organizational Performance: Organizational performance is the outcome of several business factors, including work processes, team/group communication and interaction, corporate culture and image, policies, leadership, and a climate that promotes innovation, creativity, and loyalty (Haworth, 2007).

The Balanced Scorecard: The Balanced Scorecard is a performance measurement tool invented by Robert Kaplan and David Norton (1992). It attempts to overcome insufficiencies of traditional performance measurement tools by balancing financial and nonfinancial indicators. It attempts to measure organizational performance in four different perspectives: financial, customer-related, internal business, and learning and growth.

Tobin's *q*: Tobin's q was developed by James Tobin (1969), and refers to the ratio that compares the market value of company's stocks with the value of its equity book value. If Tobin's *q* is greater than 1.0, it could indicate that the market value reflects unrecorded or unmeasured company assets, which can be intangible assets of the company. On the other hand, if the ratio is less than 1.0, it implies that market value of the assets is less than the recorded value. Since the ratio of Tobin's *q* is an intangible and forward-looking organizational performance measure, it has been used for various research studies related to the issue of knowledge management.

Chapter 1

Introduction

Statement of the Problem

Knowledge management is critical in the contemporary business environment that mandates continuous adaptation and change by organizations, and requires employees to strive to improve their company's work processes. An employee's work has become more complex because it relates to different parts and levels of the organization, and management requires more complex decision making. In contemporary society, rapid changes in the global marketplaces and customers' needs as well as revolutionary technological developments challenge managers to predict and respond in a fast-paced environment. Knowledge sharing in organizations is critical to surviving in an environment in which technologies change rapidly and competition is high (Chinowsky & Carrillo, 2007). In general, knowledge represents power, and through knowledge-sharing processes, the power and potential of knowledge is spreading (Buckman, 2004). Moreover, organizations must connect knowledge-oriented processes, technologies, and organizational forms with their business strategies to maintain a sustainable knowledge advantage (Zack, 1999).

The problem is that contemporary organizations and employees have suffered from information overload and the lack of time to share knowledge (KPMG, 2000). Employees are increasingly lost amidst an immoderate amount of information, experiencing an endless and expensive cycle of searching, sorting, and assessing information (Rao, 2003). According to the International Data Corporation (IDC), Fortune 500 companies lose at least $31.5 billion annually by failing to manage knowledge (Babcock, 2004). Nonetheless, businesses and the government

invest an immense amount of money and resources in knowledge management technology and systems that might show few, if any, results. In 2002, businesses spent $2.7 billion on new systems; this investment increased to $4.8 billion in 2007 (Babcock, 2004). The U.S. government will increase its investment 35 percent from 2005 to 2010 on three segments: equipment, software, and professional services (INPUT, 2005). While managers request more staff, resources, software, and training, these investments may be only temporary solutions and may not alleviate the fundamental problems.

Typically, organizations attempt to combine and coordinate their unique knowledge with traditional resources, processes, and capabilities in new and distinct ways, and transform them into innovative resources better than those of their competitors. Zack (1999) stated that "knowledge can be considered the most important strategic resource, and the ability to acquire, integrate, store, share, and apply it the most important capability for building and sustaining competitive advantage" (p.128). Knowledge, especially tacit knowledge, is usually embedded in complex organizational processes and routines that are hard to imitate, so competitors need to engage in similar experiences that require time and effort in order to gain similar knowledge. For these reasons, the ability to identify, absorb, and utilize knowledge is critical to a company's strategic success (Casselman & Samson, 2007). If an organization's employees learn and accumulate knowledge from their experiences and reapply it beyond their core competencies so it is directly related to the company's product or service, the company will gain a strategic advantage (Zack, 1999).

It is critical to understand how to utilize information and data to create and transfer knowledge from an individual to the organization. The most valuable store of knowledge remains in the mind of an employee, and can easily be lost when that individual leaves the

organization. Therefore, a knowledge management system is a feasible solution to the problem of capturing individual knowledge, storing it in an organizational memory bank, distributing it to the entire organization, and then using it to create new knowledge (Büchel & Probst, 2000; Iftikhar, 2003; Jones, 2003; Nonaka, 1994). Knowledge management may be defined as any effort used to handle knowledge, such as collecting, storing/retrieving, applying, sharing, and creating (Alavi & Leidner, 2001; Bhirud, Rodrigues, & Desai, 2005; Kotelnikov, 2008; Milam, 2005; Sabherwal & Sabherwal, 2007). Moreover, it entails any method designed to help individuals, groups, teams, and organizations to systematically and routinely manage what employees know, what others know, what teams or organizations know, and what they must know, regarding work process, technology infrastructure, and the knowledge-sharing culture (Milam, 2001). The difficulty of maintaining and storing vast amounts of data, information, and knowledge causes inefficiency, uninformed decisions, and duplication of efforts (Büchel & Probst, 2000). Even though two organizations may have similar numbers of employees and financial assets, one may not succeed, depending on whether they invest in effective knowledge management. Frappaolo (2006) noted that "knowledge management suggests that an organization makes a subtle yet profound shift – from relying on its experience (or knowledge of the past) to relying on its competencies (or resourcefulness to handle the future)" (p. 13).

Importance of knowledge creation and sharing.

All organizations must deal dynamically with a changing environment. In the past, information-processing or problem-solving skills were used mostly to manage a static environment. In today's rapidly changing environment, using this strategy will not ensure that an organization can address complex customer needs and provide complicated services. Organizations must transform and innovate in order to deal with complex and fast-changing

business circumstances (Edwards, et al., 2003; Gorelick & Tantawy-Monsou, 2005). Nonaka (1994) stated that "innovation can be better understood as a process in which the organization creates and defines problems and then actively develops new knowledge to solve them" (p. 14). One of the most critical survival skills for contemporary organizations is the capability to create and share their knowledge, which can enable them to innovate (Gold, Malhotra & Segars, 2001).

Knowledge can be created only by individuals, and an organization acts as an institution for knowledge integration, whether or not it has a formal knowledge management system. An organization can store only so much knowledge from individuals in an explicit form, for example, manuals, product specifications, scientific formulas, etc., that can be useful in information systems. Once that knowledge is articulated explicitly, organizational information systems can readily disseminate it to others in the organization. When knowledge is shared, its value multiplies. Although a single individual's knowledge might have little impact on the organization, knowledge sharing can make it available to other individuals and foster innovation in the organization (Nonaka & Takeuchi, 1995). Feedback, questions, amplifications, and modifications can add value to the original knowledge (Bhirud, Rodrigues, & Desai, 2005). Simply, if something goes well or wrong, lessons can be identified and shared, and if something is learned from the lessons that applies to similar situations in the future, the organization can benefit enormously (Milton, 2007a). In other words, knowledge-sharing behavior can facilitate learning among organizational members and lead them to apply solutions to similar problems encountered by others in the past, so it can help the organization to respond quickly to its customers and a harsh environment (Sher & Lee, 2004).

Usually the knowledge-creation and -sharing processes are not totally different; rather, they occur simultaneously (Milton, 2007). If these processes occur dichotomously, benefits will

be limited. If knowledge is created but never shared, it benefits only the individual who created it. In addition, if knowledge is shared but no value is added to it, the organization remains anachronistic and reaps few, if any, competitive advantages. Knowledge creation is defined as "a continuous process through which one overcomes the individual boundaries and constraints imposed by information and past learning by acquiring a new context, a new view of the world and new knowledge" (Nonaka, Krogh, & Voelpel, 2006, p. 1182). Naturally, knowledge sharing can induce learning, and learning is the process that facilitates the acquisition or creation of knowledge (Allee, 1999). Knowledge creation is directly connected with organizational innovation, and the organization can elevate its value by fostering more innovation than its competitors (Bhirud, Rodrigues, & Desai, 2005). The ability to innovate is recognized as a necessary condition for survival in business, and continuous product and process innovation are prerequisites for sustained competitive advantage. Knowledge sharing and creating within an organization usually includes sharing expertise on product development, best practices, process improvement discoveries, and knowledge about the customer's needs, habits, and attitudes, which could be considered the capability to innovate (Chua, 2001). In this context, knowledge-sharing and -creating processes are related to organizational performance and innovation. However, the knowledge-sharing processes are complicated because an organization often does not recognize what it knows or finds it difficult to locate prior internal knowledge (Sabherwal & Sabherwal, 2007). Many organizations struggle to maintain the flow of internal data, information, and knowledge, and not doing so can lead to inefficiency, asymmetrical distribution of knowledge within an organization, uninformed decisions, and duplication of efforts (Büchel & Probst, 2000; Hsu, 2008).

Research has shown that knowledge management helps organizations to create and share new knowledge noticeably quicker and more extensively than its competitors that do not manage knowledge well (Frappaolo, 2006; Hsu, 2008; Sanchez, 2005). Knowledge management enables organizations to capture, codify, and disseminate their knowledge to improve the effectiveness and efficiency of its operation (Alavi & Leidner, 1999). Implementing knowledge management may benefit a business in the areas of: overall cost reduction; improving business process efficiency; faster R&D cycle time; enhancing service quality and greater consistency; and improving customer relations (Gorelick & Tantawy-Monsou, 2005; Milam, 2001; Sanchez, 2005). However, definitions and concepts of knowledge management are still vague, and knowledge management is often confused with information technology (Khalifa & Liu, 2003). At this point, it is beneficial to define "knowledge" and "knowledge management," and discuss how to implement the latter to increase the effectiveness of an organization.

Knowledge and Knowledge Management

Knowledge.

Attempts to define knowledge have been debated since the ancient Greek era; there is no single definition for it. Knowledge is an abstract concept that has no direct referent in the real world (Andriessen & Boom, 2007), and is "a multifaceted concept with multilayered meaning" (Nonaka, 1994, p. 15). Nevertheless, in general, knowledge can be defined as experience, know-how, insight, information, and capabilities (Chou & He, 2004; Dixon, 2000).

Knowledge is distinguished from data and information. Data are factual descriptions of certain events quantitatively or qualitatively, and when data are interpreted into a meaningful framework, they become usable information (Sanchez, 2005; Vance, 1997).

Furthermore, knowledge may be categorized into two types, depending on its modes of expression: tacit and explicit (Chou, 2005; Frappaolo, 2006; Noe, 2002; Nonaka, 1994; Nonaka, Toyama, & Konno, 2000). Tacit knowledge is deeply rooted in action, commitment, and involvement in a specific context, including cognitive and technical elements (Nonaka, 1994). On the other hand, explicit knowledge is codified or visualized in a clear language format that is often called information (Carvalho & Ferreira, 2001; Noe, 2002; Nonaka, 1991; Nonaka, 1994; Nonaka et al., 2006; Weiss & Prusak, 2005). Tacit and explicit knowledge are not dichotomous states, but are mutually dependent and reinforcing qualities. Tacit knowledge acts as a background necessary for forming the structure used to develop and understand explicit knowledge (Polanyi, 1964). Both types of knowledge are valuable to organizations, but often tacit knowledge is not made explicit nor shared (Ford & Chan, 2002; Frappaolo, 2006). Cohen (1998) recognized that both types of knowledge should be managed successfully to leverage intellectual assets that will add value to the organization.

Knowledge management.

Because there is no single definition of knowledge, it is also difficult to define knowledge management. Generally, knowledge management is a multidimensional process that includes identifying, acquiring, developing, distributing, utilizing, and storing knowledge that can be significant to organizations (Büchel & Probst, 2000; Yen, 2001). It entails handling not only explicit, but also tacit knowledge. To enhance organizational performance and create value, the organization must be able to manage both tacit and explicit knowledge through systematic and specific processes for acquiring, organizing, sustaining, applying, sharing, and renewing both types of knowledge (Bhirud, Rodrigues, & Desai, 2005).

Many researchers and practitioners have defined knowledge management from pluralistic points of view. In general, there are three major trends in defining knowledge management: work processes or activities (Carvalho & Ferreira, 2001; Marwick, 2001; Milam, 2005), technological infrastructure (Alavi & Leidner, 1999; Chinowsky & Carrillo, 2007; Hansen, Nohria, & Tierney, 1999), or behavioral norms and practices – often called organizational culture (Chong et al., 2000; De Long, 1997; Hauschild, Licht, & Stein, 2001; Pauleen, Wu, & Dexter, 2007). The three major perspectives used to define knowledge management will be discussed further in Chapter 2. However, these definitions share one objective, that is, to help an organization manage knowledge well in order to become more flexible, respond more quickly to a changing market environment, be more innovative, and improve decision making and productivity (Alavi & Leidner, 1999).

Organizations focusing on knowledge management typically emphasize collaboration, organizational learning, best practices, workflow, intellectual property management, document management, a customer-centric focus, and using data effectively (Milam, 2001). Ideally, a knowledge management system organizes and disseminates knowledge effectively and encourages the creation of new knowledge (Bhirud, Rodrigues, & Desai, 2005; Gorelick & Tantawy-Monsou, 2005). It also leverages collective knowledge and encourages responsiveness and innovation through connecting individuals to collect multiple experiences and perspectives (Frappaolo, 2006). Knowledge management brings together people with various perspectives to look at specific problems, and by encouraging people to share knowledge, a better solution can be found (Buckman, 2004). In general, organizations with no formal knowledge management may miss numerous good practices, repeat mistakes, and lose what employees learn from

customers, partners, or competitors, thus missing information that can be improved, shared, and reused (Gorelick & Tantawy-Monsou, 2005).

Knowledge management capabilities.

Gold, Malhotra, and Segars (2001) reported that while many organizations have invested in developing knowledge management, many of those projects have remained in the realm of information projects, which make little contribution to innovation regarding products and services. Effective knowledge management recognizes, creates, transforms, and distributes knowledge. Knowledge management competence may be classified into two types: knowledge infrastructure capability and knowledge processing capability. The former includes technology, structure, and culture, while the latter refers to acquisition, conversion, application, and protection (Figure 1).

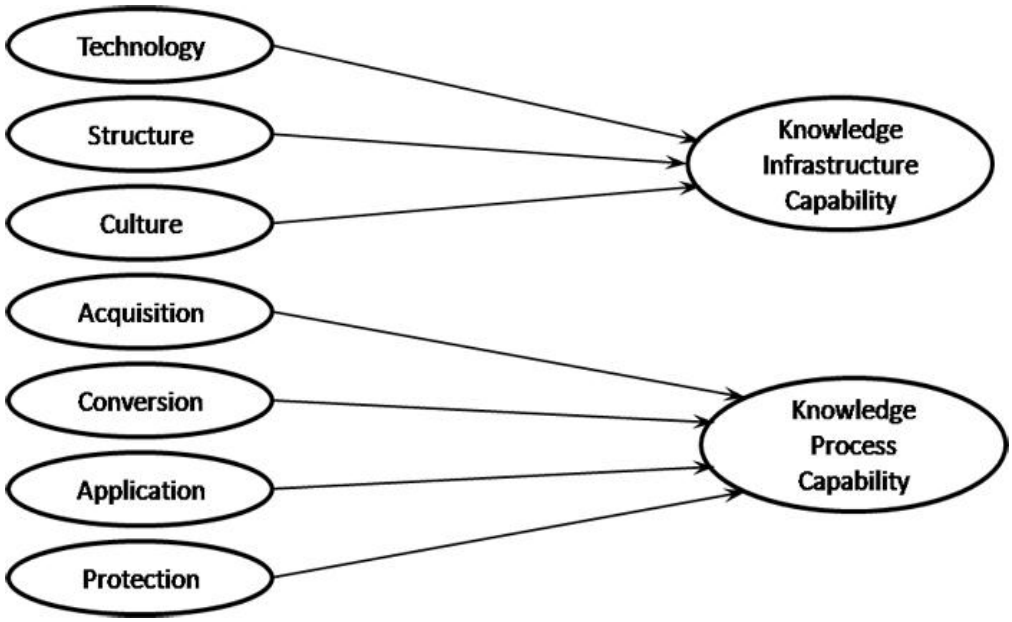

*Figure 1.*The original framework of knowledge management capabilities.

It is unlikely that knowledge sharing would occur if there were no knowledge providers to facilitate the process. This process requires funds, effort, and time, and if there were no

appropriate rewards, there would be no knowledge sharing (Evaristo, 2005). Incentives, whether monetary or nonmonetary, are considered to be important catalysts to motivate and encourage knowledge sharing (APQC, 2001; Evaristo, 2005; Gammelgaard, 2007; Sanchez, 2005; Stajkovic & Luthans, 2001; Suresh, 2002; Wolfe & Loraas, 2008). In this study, incentives will be added into the original framework of knowledge management capabilities.

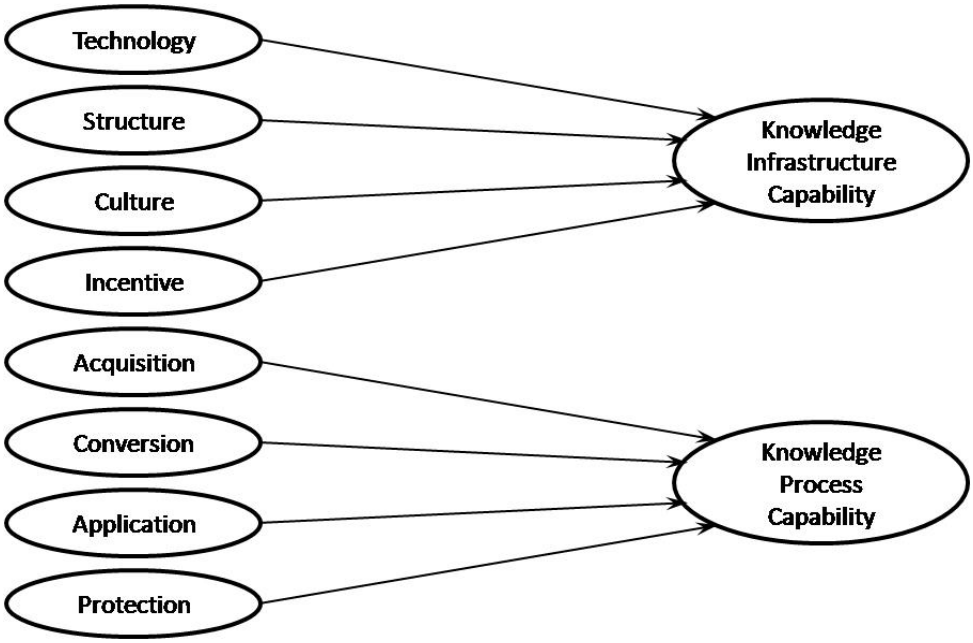

*Figure 2.*The modified framework of knowledge management capabilities.

Measuring Organizational Performance

Organizational performance is the result of several business factors: work processes, team/group communication and interaction, corporate culture and image, policies, leadership, climate for innovation and creativity, loyalty, and the economic and business environment (Haworth, 2007). An organization must constantly strive to improve performance. Traditionally, organizational performance was measured using financial data; however, financial measurements

define the results of actions already taken and are usually reported at the end of projects, so there is no instant feedback when a problem occurs. In this sense, a single financial performance measurement could not support the continuous improvement and innovation of the organization (Kaplan & Norton, 1992). Much research has found that traditional financial accounting measures such as return on investment, earnings per share, or return on assets yield limited results regarding continuous improvement and innovation (Huang, 2009; Kaplan & Norton, 1992).

Kaplan and Norton (1992) first introduced the Balanced Scorecard, and it has been a major focus of performance evaluation in recent years. The Balanced Scorecard is now considered to be a more complete measurement of organizational performance than the traditional financial measurement. It involves four perspectives: learning & growth, internal business process, the customer perspective, and the financial perspective. By combining financial and nonfinancial measurements, organizations may link long-term strategic objectives with short-term action, enabling managers to consider multiple interrelationships and causal effects (Huang, 2009; Kaplan & Norton, 1996). The Balanced Scorecard may be one of the most reliable tools for measuring various aspects of organizational performance.

Kaplan and Norton (1996) suggested that the Balanced Scorecard should be flexible and adaptable for each unique organization. It must be customized to fit a company's mission, strategy, and culture, and should not be used as a single template to apply to businesses in general. However, Ras and Torraco (2009) stated that "this flexibility also creates an inconsistency that makes comparison across companies impossible" (p. 22). Since the Balanced Scorecard is designed based on the uniqueness of each organization, it hardly provides a unified, industry-wide view with clear recommendations (Jensen, 2001). Moreover, because the Balanced

Scorecard is customized, it often focuses only on what an organization is good at, blurring what needs to be improved (Federal Chief Information Officers Council et al., 2004). It is meaningless to compare organizations with their own Balanced Scorecards. Instead, it is necessary to have a standardized performance measurement tool to investigate the effect of some business initiatives. Organizational performance is best measured from multiple perspectives, and the Balanced Scorecard is a powerful measurement tool to achieve strategic alignment and planning, by integrating financial and nonfinancial aspects of organizational performance (Huang, 2009; Kaplan & Norton, 1996; Niven, 2006).

The main purpose of this study is to compare knowledge management among organizations and determine whether their investment in knowledge management pays off in organizational performance and profitability. This goal requires unified and standardized organizational performance measures. Therefore, for the current study, the concept of the four perspectives of organizational performance was borrowed and an attempt was made to develop a generalized organizational performance measurement tool. To identify the effects of knowledge management capabilities on organizational performance, the measures of organizational performance should be standardized with essential organizational performance indicators.

Knowledge Management and Organizational Performance

Every private organization expects a positive outcome from investments. The fundamental purpose of investment in knowledge management is to increase organizational performance, which directly relates to profitability by improving organizational effectiveness, innovation, and communication (Bhirud, Rodrigues, & Desai, 2005; Martin, 2003). Linking knowledge management to organizational performance and profitability strongly encourages top

management to emphasize knowledge management, by showing the benefits it can have on the organization's bottom line (Carrillo et al., 2003).

KPMG conducted knowledge management research in 1998, 2000, and 2003 to determine organizations' perspectives on knowledge management, the goals they hoped to achieve by implementing it, and the benefits they derived from it. For the 1998 knowledge management report, KPMG surveyed chief executives, finance directors, marketing directors, and those with specific responsibility for knowledge management in 100 leading UK companies. According to the 1998 report, the following percentages of organizations achieved the benefits listed by implementing knowledge management: better decision-making (86%), reduced costs (70%), faster response time to key issues (67%), shared best practices (60%), new/additional business opportunities created (58%), increased profit (53%), and increased market share (42%). For the 2000 report, similar management in 423 companies worldwide responded to a survey, reporting that knowledge management played an "extremely significant" or a "significant" role in improving competitive advantage, in the following categories: marketing (75%), improved customer focus (72%), product innovation (64%), revenue growth (63%), growth in profit (63%), employee development (57%), improved decision making (71%), faster response to key business decisions (68%), and better customer handling (64%). In the 2003 report, organizations reported synergies among units (83%), accelerated innovation (63%), higher customer added value (74%), reduced costs (67%), improved quality (70%), and reduced exposure to risk (26%) by using knowledge management. Fifty percent of total respondents reported clear financial benefits and returns.

Although it is highly feasible that there is a positive relationship between knowledge management and organizational performance, empirical studies have been deficient in supporting

that relationship (Carrillo et al., 2003; Choi & Lee, 2003; Hsu, 2008; Martin, 2003).The main purpose of the current study was to identify the empirical relationship between knowledge management capabilities and organizational performance in the South Korean KOSPI 200 organizations.

South Korean Knowledge Management

The South Korean economy has developed significantly following the devastation of the Korean War. In the 1950's, South Korea was one the poorest countries in the world, and initially, the South Korean economy was recovered by a few major companies under the control and protection of the government, often called *Chaebol,* referring to a South Korean form of business conglomerate. Because *Chaebol* could break into new markets and assume a dominant position in the ongoing market due to size and resources, they have played a significant role in pushing the South Korean economy to new heights. However, in the era of information and knowledge where flexibility and adaptation are required, the vast organizations could not keep up with the speed of change (Baek, 2002). Therefore, the South Korean economy had a major financial crisis in 1997, and many companies were bankrupted and segmented. *Chaebol* realized that a new model of management was required to change in the new business environment.

After the economic crisis, many South Korean companies adapted new business initiatives, such as reducing their size, restructuring their businesses, and building a new organizational culture (Baek, 2002). The field of knowledge management has become one of the most important considerations in strategic innovation. However, studies to identify knowledge management key indicators are not sufficient in South Korea (Seo, Lee & Kim, 2006). Due to insufficient literature and guidelines about South Korean knowledge management, organizations

are highly dependent on temporal solutions and case studies in building and implementing knowledge management. Kwon, Yeon and Park (1999) identified that most South Korean companies recognize the value of knowledge management in building a technological infrastructure. However, most knowledge management initiatives are highly dependent on how people exploit, share, use, and create knowledge, not on the technological infrastructure itself (Davenport, 1994; Jones, 2001). Also, several empirical studies about South Korean knowledge management have found that the will of CEOs is the most important factor for implementing knowledge management (Choo & Kang, 2005; Seo, et al., 2006). However, investing large amounts of money and manpower on building a technological infrastructure, or relying heavily on the CEOs will not guarantee the success of knowledge management. It is critical to build the theoretical or empirical background about knowledge management in South Korea.

Problem Statement and Purposes of the Study

Problem statement.

In a knowledge-based environment, it logically follows that knowledge management explicitly helps organizations improve organizational performance (Sabherwal & Sabherwal, 2007). However, organizations are often challenged to identify the relationship between knowledge management and organizational performance because the implementation of knowledge management often occurs informally (Carrillo, 2003). It is critical that organizations determine whether the investment in a knowledge management system pays off in terms of demonstrable performance improvement (Iftikhar, 2003). However, many knowledge management-related studies focus only on fragmented or limited knowledge management perspectives, such as knowledge sharing (Hsu, 2008; Papoutsakis, 2007), information flow (Zen,

et al., 2007), and knowledge management styles (Choi & Lee, 2003). In order to make knowledge management more effective, it is important to identify all possible cultural aspects, tools, contexts, infrastructures, or processes that influence it (Chou & He, 2004). Moreover, it is necessary to develop a holistic framework for knowledge management.

Purposes of the study.

Gold, Malhotra, and Segars (2001) attempted to integrate the fragmented literature of knowledge management into a holistic view and develop a framework for knowledge management. Several research studies have validated the framework of knowledge management capabilities created by Gold, Halhotra, and Segars (Khalifa & Liu, 2003; Smith, 2006b). However, the framework has not been tested in South Korea's business environment. The main purpose of the current study is to validate the framework in a study of South Korean companies. Additionally, the original framework did not provide a thorough explanation of the effect of incentives on the knowledge management processes. Inasmuch as incentives motivate and encourage knowledge sharing and improve performance, this aspect must be included. In this study, the modified framework that includes incentives in the knowledge infrastructure capability will be tested.

The original and previous studies selected senior managers in the organization, at the level of vice-president or above, who could describe the structural elements of the organization and its knowledge-oriented processes. It should be noted that the business environment of South Korea may be totally different from that of Western companies. For instance, in the South Korean business environment, senior managers are not usually actively involved in working processes. Instead, they make decisions about the future direction of a company, scrutinize the decisions of CEOs, and make decisions regarding profit allocation (Kim, 2003). Additionally,

they are often sensitive about revealing their roles in organizational success (Choi & Lee, 2003; Kim, 2003). Gold et al. (2001) stated, "the use of key informants for knowledge management purposes can come from those in the organization that have access to, and use of, the organization's knowledge" (p.197). Informants for knowledge management can be any organizational members in an organization, but for the current study, the targeted sample should satisfy three conditions: persons who can interact with top management, those who are actually working with the bottom line, and those who have a certain amount of autonomy to lead a project, team, or department. Nonaka (1988) emphasized the importance of the role of middle managers, who are charged with integrating the viewpoints of those in top and bottom levels of management, and in which there will be no improvement in an organization without this integration. In the South Korean business environment, middle managers typically work at three levels and are the most active players in the knowledge management process: *Bu-jang* (부장), *Cha-jang* (차장), and *Gwa-jang* (과장).

After Gold (2001) introduced the framework for knowledge management capabilities, researchers studied the correlation between knowledge management capabilities and key business issues. The Gold et al. (2001) study found that knowledge infrastructure capability and knowledge process capability significantly affected organizational effectiveness. Further, Smith (2006b) discovered that both knowledge infrastructure and knowledge process capabilities have a significantly positive impact on organizational effectiveness. Smith also attempted to link business strategy to knowledge management capabilities in the framework, but found no empirical evidence to support his hypothesis. Khalifa and Liu (2003) found that both knowledge infrastructure and knowledge process capabilities could explain knowledge management success. However, none of the research studies attempted to identify how knowledge management

capabilities are directly linked to organizational performance. The relationship between knowledge management and organizational performance was still unknown, until the current study responded to that need by investigating the relationship between business performance and successful knowledge management capabilities. Specifically, this study used empirical evidence to identify the relationship between knowledge management capabilities and the four perspectives of organizational performance (Figure 3).

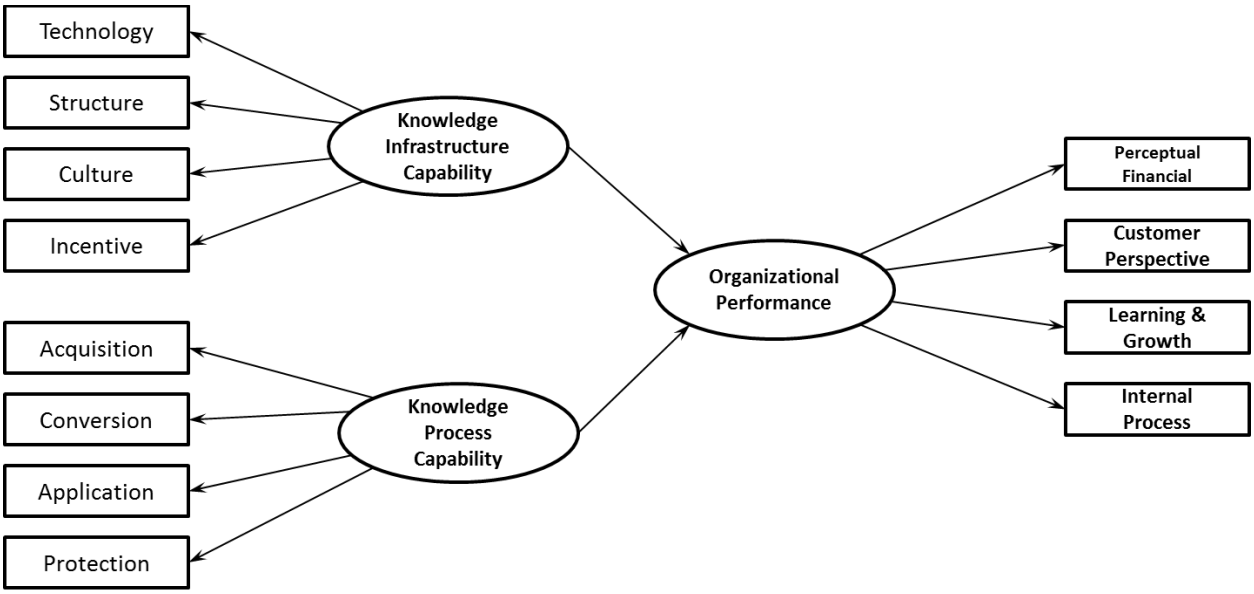

Figure 3. Knowledge management capabilities and organizational performance.

Smith (2006b) noticed that an improvement in knowledge infrastructure capability could lead to a strong and positive improvement in knowledge process capability. This suggests that investing in knowledge infrastructure capability could improve knowledge process capability and lead to improved organizational effectiveness. However, he did not identify the relationships among the elements of knowledge infrastructure and process capabilities. Elements of knowledge management capabilities are connected and systematically affect one another (Bhirud, Rodrigues & Desai, 2005; Gorelick & Tantawy-Monsou, 2005; Iftikhar, 2003).

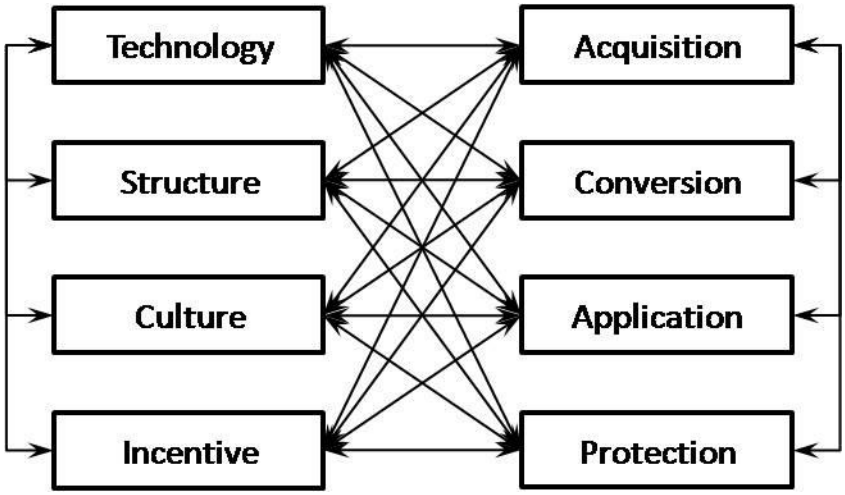

Figure 4. Internal relationships among knowledgemanagement capabilities.

A goal of the current study is to identify the internal relationships among knowledge management capabilities (Figure 3), which can help managers evaluate how effectively their organizations manage knowledge assets in order to improve organizational performance.

Research Questions

Responding to the main inquiry of the study to identify the relationship between knowledge management capabilities and organizational performance in the viewpoint of the Balanced Scorecard in the South Korean business context, the four primary research questions for this study are the following:

1. What is the impact of knowledge management capabilities on organizational performance in the South Korean business environment?

    1-a. What kinds of structural relationships between knowledge management capabilities and the four perceptual aspects of organizational performance exist in the South Korean business environment?
    1-b. How do the eight variables of knowledge management capabilities relate to the four perceptual variables of organizational performance in the South Korean business environment?

1-c. How do the eight variables of knowledge management capabilities relate to the objective financial organizational performance in the South Korean business environment?

2. What is the internal relationship among the eight different knowledge management capabilities aspects?

3. Do differences in practicing knowledge management exist between the upper 100 companies in the KOSPI 200 and the lower 100 companies in the KOSPI 200 organizations?

4. Do differences exist between manufacturing and non-manufacturing organizations in the KOSPI 200?

The first primary research question involved determining whether an organization's investments in knowledge management pay off through organizational performance. Linking knowledge management to organizational performance makes a strong case for adopting and funding knowledge management and demonstrating its benefits (Carrillo, Robinson, Anumba & Al-Ghassani, 2003). Although it is highly feasible that there is a relationship between knowledge management and organizational performance, empirical studies have been deficient in proving that relationship (Carrillo et al., 2003; Choi & Lee, 2003; Hsu, 2008; Martin, 2003). Moreover, other studies have emphasized financial indicators as measurements of organizational performance, rather than nonfinancial variables because managers constantly aim to maximize the shareholders' return on investment (Laitinen & Chong, 2006). It is important that organizations adopt both financial and nonfinancial variables in the organizational performance measuring process. In this study, to measure organizational performance, the concept of Kaplan and Norton's Balanced Scorecard (1996) was applied, which enables an evaluation of organizational performance, using both financial and nonfinancial perspectives. Related to the first primary research question, there are three secondary research questions.

The first secondary research question (1-a) was to examine the structural relationship between the latent constructs of knowledge management capabilities, namely, knowledge infrastructure capability and knowledge process capability, and perceptual organizational performance. The next secondary research question (1-b) was to examine the relationships between the eight variables of knowledge management capabilities: technology, structure, culture, incentive, acquisition, conversion, application, and protection; and the four perceptual variables of organizational performance: customer-related, internal business process, learning & growth, and the financial aspect. Lastly, the third secondary research question (1-c) was to examine the direct relationship between eight variables of knowledge management capabilities and the financial objective organizational performance by using Tobin's *q.*, as an objective measure of firm performance.

The second primary research question identifies the internal relationships among eight different knowledge management capabilities aspects: technology, structure, culture, incentive, acquisition, conversion, application, and protection. This question is:

> 2. What are the internal relationships among the eight different knowledge management capabilities aspects?

Many knowledge management projects fail because viewing knowledge management as an isolated issue fails to support knowledge management implementation completely (Iftikhar, 2003). Because managing knowledge is a multidimensional process considering content, culture, process, and infrastructure, it is necessary to implement it from a holistic point of view (Yen, 2001). To understand the operation of knowledge management holistically, it is important to address the key elements in implementing knowledge management, and how they relate to each other. Gold (2001) found that individual variables of knowledge management capabilities are related. However, Gold did not investigate the relationships across knowledge infrastructure and

knowledge process capabilities. On the other hand, Smith (2006b) found a positive relationship between knowledge infrastructure and knowledge process capability. He noted that an improvement in knowledge infrastructure capability could lead to a strong and positive improvement in knowledge process capability. This suggests that investing in knowledge infrastructure capability could improve knowledge process capability and lead to improved organizational effectiveness. However, he did not identify the relationships among the elements of knowledge infrastructure and process capabilities. Elements of knowledge management capabilities are connected and systematically affect one another (Bhirud, Rodrigues, & Desai, 2005; Gorelick & Tantawy-Monsou, 2005; Iftikhar, 2003). Therefore, this study attempted to identify the relationships among knowledge management capabilities (Figure 4).

The third primary research question examined the difference between knowledge management capabilities practiced by the upper and lower group of organizations in the KOSPI 200. The third research question is:

> 3. Do differences in practicing knowledge management exist between the upper 100 companies in the KOSPI 200 and the lower 100 companies in the KOSPI 200 organizations?

The KOSPI 200 organizations represent the major corporations in South Korea, which comprised 93% of the total market value of the Korean Stock Exchange. Within the KOSPI 200 organizations, the upper 100, which are the largest organizations in South Korea, occupied 96.4% of the total market value of the KOSPI 200. There might be group differences between the upper 100 and the lower 100 KOSPI 200 organizations that might cause a biased investigation in implementing knowledge management in the KOSPI 200 organizations. Therefore, this study attempted to identify the differences between the upper and the lower 100 organizations in the KOSPI 200 regarding their knowledge management capabilities and organizational performance.

The fourth primary research question was to examine the group differences between manufacturing and nonmanufacturing organizations within the KOSPI 200. This question was:

> 4. Do differences exist between manufacturing and non-manufacturing organizations in the KOSPI 200?

According to the list of companies in the KOSPI 200 on December 31, 2010, there are 142 manufacturing (71%) and 58 nonmanufacturing organizations (29%). Manufacturing and nonmanufacturing might have different organizational structures, cultures, and processes related to knowledge management. Seo, Lee, and Kim (2006) identified that nonmanufacturing organizations cited organizational culture as an important factor in successful knowledge management projects in South Korea. However, differences in knowledge management capabilities between manufacturing and non-manufacturing companies were still unknown within the KOSPI 200 organizations. Therefore, this study attempted to identify the differences between manufacturing and nonmanufacturing KOSPI 200 organizations regarding their knowledge management capabilities.

Significance of the Study

Contemporary organizations tend to coordinate the unique knowledge of their organizations with traditional resources, processes, and capabilities in new and distinct ways in order to gain a competitive advantage. Zack (1999) stated, “knowledge can be considered the most important strategic resource, and the ability to acquire, integrate, store, share, and apply it is the most important capability for building and sustaining competitive advantage” (p.128). However, the link between knowledge management and organizational performance is not supported by sufficient empirical studies (Choi & Lee, 2003). Moreover, the field of knowledge management is new, and there is little research and empirical data to guide the development and

implementation of knowledge management or to support the potential benefits of it (Alavi & Leidner, 1999). In addition, most quantified research has focused on limited and fragmented aspects of knowledge management. For these reasons, the current study quantifies knowledge management issues holistically in order to understand the organizational performance implications of knowledge management.

Gold, Malhotra, and Segars (2001) developed the framework for knowledge management capabilities, attempting to integrate the fragmented knowledge management issues. Several replication studies have proved the validation and reliability of the framework of knowledge management capabilities in different global locations, but it has never been done in the South Korean business environment. The current study examines the framework of knowledge management capabilities empirically in the South Korean business environment for the first time and analyzes the results in the context of South Korean organizations.

Gold, Malhotra, and Segars (2001) identified the relationship between knowledge management capabilities and organizational effectiveness, and defined organizational effectiveness as the ability to innovate, improve coordination of efforts, promote rapid commercialization of new products, anticipate surprises, respond to market change, and reduce redundancy of information/knowledge. Their studies presumed that organizational effectiveness could improve organizational performance, but did not empirically test that assumption. Since the major purpose of the current study is to identify whether companies' investments in knowledge management infrastructures and processes pay off, the direct relationship between knowledge management capabilities and organizational performance will be identified.

Because managers must constantly maximize the financial return to shareholders, a tendency exists for organizations to be mindful of the financial perspectives of organizational

performance while discarding the nonfinancial variables (Laitinen & Chong, 2006). However, it is important that organizations consider both financial and nonfinancial variables in the organizational performance measuring process. In the current study, to measure organizational performance, the concept of Kaplan and Norton's (1996) Balanced Scorecard will be applied, which enables an evaluation of organizational performance, using both financial and nonfinancial perspectives. However, there is no fixed financial performance measurement tool for the Balanced Scorecard. For the current study, the ratio of Tobin's q will be used, because it is a good financial indicator for measuring a company's intangible assets, as well as long-term organizational performance.

It is important for research on knowledge management to determine whether organizations' investments yield results in terms of demonstrable performance improvement. Further understanding of the knowledge management and organizational performance relationship can assist managers in implementing a knowledge management system and also provide a theoretical ground for researchers to pursue a deeper understanding of knowledge management.

Summary of the Study

This dissertation includes five chapters. Chapter 1 states the purposes and significance of the study.

Chapter 2 provides a review of various research literature that relates to knowledge, knowledge management, knowledge management capabilities, and multiple aspects of organizational performance using the Balanced Scorecard.

Chapter 3 considers the sample, data collection processes, and research methods used in the study. For collecting data, the online survey method is implemented as a main instrument, and data are collected from middle managers from major South Korean companies. Because the study attempted to indentify the linear relationship between knowledge management capabilities and organizational performance, a correlational research design is used.

Chapter 4 presents the results and findings for the statistical analysis conducted in this proposed study, which includes an overview of the data collection techniques as well as a description of the sample. The description of the sample includes a presentation of the demographic characteristics of the participants. The results of the Pearson's correlation analysis between the variables and the Structural Equation Model (SEM) are presented.

Chapter 5 discusses the implications of the findings and the contributions of the study, which are discussed theoretically, practically, and methodologically. The limitations and suggestions for future analyses are also considered.

Chapter 2

Literature Review

Definition of Knowledge

The ability to achieve and use knowledge is one of the main abilities of human beings, and it distinguishes humans from other creatures. Philosophers from as far back as the Greek era have attempted to define knowledge, and this inquiry has led to many epistemological debates. Generally, knowledge can be defined as what is known. According to Webster's dictionary (1996), knowledge is defined variously as "(i) the act, fact, or state of knowing; a) acquaintance or familiarity (with a fact, place, etc.), b) awareness, c) understanding, (ii) acquaintance with facts; range of information, awareness, or understanding, (iii) all that has been perceived or grasped by the mind; learning; enlightenment, and (iv) the body of facts, principles, etc. accumulated by mankind . Others have categorized knowledge as "intangible, fluid, personal, elusive, invisible, immeasurable, and ever evolving" (Gorelick & Tantawy-Monsou, 2005, p.126), and as "a multifaceted concept with multilayered meaning" (Nonaka, 1994, p.15).

Contemporary scholars have defined knowledge from pluralistic perspectives. Alavi and Leidner (2001) viewed knowledge as a state of mind, an object, a process, a condition of having access to information, or a capability, and emphasized that it enables individuals to expand their personal learning and apply it to meeting their needs. It can be categorized into two dimensions: "a condition of understanding gained through experience or study" and "the sum or range of what has been perceived, discovered, or learned" (p.110). Knowledge may be viewed as a thing, thus it can be stored and manipulated. Knowledge as a process means that knowing and acting can happen simultaneously, which could refer to applying expertise. Knowledge as a condition

of having access to information can be an extended view of knowledge as an object, especially if one focuses on the accessibility of knowledge. Lastly, knowledge can also be viewed as a capability. Thus, it has the potential to influence future action. Alavi and Leidner (2001) noted that there might be a less actionable capability in knowledge itself, but that it can promote utilizing and interpreting information and data, thereby facilitating better decision-making processes. However, since knowledge is personalized, in order for personal and group knowledge to be useful to others, it must be manipulated in some manner in order to be interpreted by the receivers.

Collison and Parcell (2004) recognized that knowledge not only means know-how, which is a definition accepted by most people, but that it also contains know-why, know-what, know-who, know-where, and know-when. Know-how involves the process, procedures, techniques, and tools for getting something done. Know-why is the ability to see the bigger picture, including strategic insight related to the context of roles and the value of action. Know-what is understanding a certain fact or information that is required prior to making a correct decision or completing a task properly. Know-who relates to social relationships, contacts, and networks through which people give and receive help from one another. This type of knowledge is dynamically created through social interactions among individuals and organizations (Nonaka, Toyama, & Konno, 2000). Know-where means an ability to navigate through a situation and find the right information, namely a "human search engine." Accompanied by the development of Internet portals, such as Yahoo, Google, etc., this type of knowledge is now emphasized in contemporary organizations, because it is critical to trace the correct knowledge without wasting time, bogged down by information overload. Lastly, know-when is understanding the best timing for doing something, making a decision, or stopping something.

Knowledge as a competitive resource.

Zack (1999) declared that: "Knowledge can be considered the most important strategic resource, and the ability to acquire, integrate, store, share, and apply it the most important capability for building and sustaining competitive advantage" (p.128). However, knowledge is not always a competitive asset of an organization. If the organization wants its knowledge to be a more valuable asset and use it to gain a competitive advantage over competitors, knowledge should be unique, inimitable, and non-substitutable (Desouza & Vanapalli, 2005). Besides having a general taxonomy, knowledge, from a business's strategic point of view, can be categorized into three different types: core, advanced, and innovative, based on whether it can support companies' competitiveness (Zack, 1999). *Core* knowledge enables one to operate a company with a minimum scope. It is commonly shared among members of the same industry and cannot be used to affirm long-term competitive viability. Even though companies in the same industry share similar kinds and levels of core knowledge, each company possesses varying kinds, because knowledge is contextual and dependent upon a company's organizational processes, culture, routines, etc. (Pauleen, Wu, & Dexter, 2007). *Advanced* knowledge is unique and differentiated knowledge that enables a company to attain superiority over its competitors. Lastly, *innovative* knowledge is that which results in a company being a leader in its industry and distinguishes it from its competitors. Innovative knowledge often enables a company to change the rules of the industry, but since knowledge is not static, innovative knowledge today will eventually become core knowledge. Thus, it is critically necessary for members of a company to continually learn and acquire knowledge in order to maintain a superior competitive position (Zack, 1999).

Data, information, and knowledge.

A distinction between knowledge and information was first made by the ancient Greeks, even though they used the terms differently. Socrates and Plato used the terms "*actual speech*" and "*written speech*" (Müller-Merbach, 2004). "*Actual speech*" is a live dialogue in which participants react to, ask, and answer questions, and try to convince each other, based on actual consciousness, conviction, engagement, and passion, which can be interpreted as knowledge. However, "*written speech*" usually does not provide for interaction. It is often passive and can be referred to as information. In contemporary times, the basic definition of information denotes data that are meaningful or useful and that have been contextualized, categorized, calculated, corrected, or condensed. Vance (1997) explained that information is data interpreted into a meaningful framework, while knowledge is information that has been authenticated and is thought to be true. The differences between information and knowledge are important because they can help us understand that knowledge sharing and creation are more interpretive, interdependent, social, and cultural activities than simple information exchange and acquisition. Information is converted into knowledge when it is processed in the mind of individuals, and knowledge becomes information once it is articulated in formal language, namely as text, graphics, words, or other symbolic forms (Alavi & Leidner, 2001; Weiss & Prusak, 2005).

From a traditional perspective, knowledge starts from data, which consists of certain facts and numbers. If data are arranged within some context, it becomes information, and when experiences and judgments are added to the mix, it finally becomes knowledge (Milam, 2006). The traditional view of knowledge may be seen as a hierarchical model, with knowledge at the top, information in the middle, and data at the bottom (Mason, 2003). Conversely, Tuomi (1999) asserted a reverse hierarchy for the relationships among data, information, and knowledge,

postulating that it is impossible to interpret data and create information without any prior knowledge. Knowledge is often acquired through interpreting certain facts or events based on the prior acquired knowledge background. Without prior knowledge, certain events or facts can often be ignored or discarded without any attention.

On the other hand, Mason (2003) took a holistic viewpoint, describing a recursive framework of data, information, and knowledge, which synthesized both the traditional and the reverse hierarchical models. Mason (2003) stated, "The most meaningful conceptual framework within which to view the relationship among learning, knowledge, information, and data is to visualize a hermeneutic, recursive process in which each is enriched and made meaningful by a consideration of the others" (p. 4).

Information generally contains facts, whereas knowledge is more subjective, focusing on linkages or relationships (Hauschild, Licht, & Stein, 2001). In general, information becomes knowledge when it is processed into the minds of individuals (Alavi & Leidner, 2001). Knowledge refers to information that individuals understand, and it is related to facts, procedures, concepts, interpretations, ideas, observations, and judgments. Each individual understands knowledge differently by including a unique set of experiences and prejudices when making decisions about its meaning, value, and use (Hauschild, Licht, & Stein, 2001). However, not every piece of information can become knowledge. If an individual fails to understand the contextual meaning of information, it remains information (Cohen, 1998). Conversely, knowledge can become information when it is articulated and expressed in the form of text, graphics, words, or other symbolic forms.

Additionally, Lang (1999) noted that information is a specific instance, and knowledge is an understanding of the domain, such as a set of principles, models, templates, equations,

insights, recipes, diagrams, and other abstractions. In this case, only information that is relevant to knowledge is used, and irrelevant information is usually abandoned. Knowledge can be reused with different sets of relevant information in another situation. For example, if one understands a specific mathematical equation for a specific problem, one could apply that understanding to a similar problem. Therefore, it is reasonable to say that knowledge is reusable.

Although a huge chunk of information may have little value, it becomes useful when individuals actively possess it through a process of reflection, enlightenment, or learning (Alavi & Leidner, 2001).

Tacit and explicit knowledge.

Knowledge also can be differentiated based on its modes of expression: tacit and explicit (Chou, 2005; Frappaolo, 2006; Noe, 2002; Nonaka, 1994; Nonaka, Toyama, & Konno, 2000). Knowledge that includes individual experience, know-how, skills, beliefs, perspectives, insights, intuitions, hunches, instincts, values, understanding of a future state, and the creative processes can be referred to as tacit knowledge (Dyck et al., 2005; Frappaolo, 2006; Sabherwal & Sabherwal, 2007). Noe (2002) defined tacit knowledge as "personal knowledge based on individual experience and influenced by perceptions and values" (p.167). Nonaka (1994) noted that tacit knowledge is "deeply rooted in action, commitment, and involvement in a specific context" (p.16), and pointed out that it can include cognitive and technical elements. The cognitive elements include personal schemata, paradigms, beliefs, and viewpoints that help individuals to form their perspectives to understand and define the world that surrounds them. On the other hand, the technical elements comprise "concrete know-how, crafts, and skills that apply to specific contexts" (Nonaka, 1994, p.16).

Expanding on Nonaka's (1994) point, Mason (2003) suggested that tacit knowledge also includes concepts of values and facts, which are commonly understood and known to a society or group, often called common sense, and these common values and facts are usually constructed and transmitted through apprenticeships and the broader cultural environment. Mason (2003) emphasized that the cultural environment, such as a national or ethnic group, can influence the construction of tacit knowledge, and once it is built, it may be difficult to change. Individuals sharing little or no common values and facts might find it difficult to stabilize the analogue process that leads to shared tacit knowledge.

Generally, tacit knowledge is difficult to articulate, express, and formalize to others, and, thus, it is transmitted in informal and subtle ways (Dyck et al., 2005; Sabherwal & Sabherwal, 2007). Lastly, since tacit knowledge is in a person's mind, it is continually changing and evolving (Rowley, 2001).

Explicit knowledge, also called codified or visualized knowledge, is that which can be transmitted in the form of formal and systematic language (Nonaka, 1991, 1994; Nonaka et al., 2006; Weiss & Prusak, 2005). Explicit knowledge is usually stated in clear language formatted in individuals' minds, so it can be stored in a knowledge database or managed by a knowledge management system (Carvalho & Ferreira, 2001; Noe, 2002). Often, explicit knowledge is referred to as information (Frappaolo, 2006). Explicit knowledge is ready to be transmitted to others in both synchronous and asynchronous ways (Frappaolo, 2006; Nonaka, 1991). Usually, explicit knowledge includes words, pictures, diagrams, computer codes, procedure manuals, and the like, so it can be conveyed to others in formal and obvious ways (Dyck et al., 2005).

Even though explicit knowledge is represented in articulated and symbolized forms that can be shared with others, it can represent different meanings to different persons with various

purposes (Weiss & Prusak, 2005). When people convert explicit knowledge into tacit knowledge, they have a tendency to interpret it based on their own particular purposes. For example, even though explicit knowledge contains various kinds of information, people adopt or reject it, and rearrange some or all based on their interests and purposes (Weiss & Prusak, 2005).

However, the two states of knowledge are not dichotomous in fact, and tacit knowledge forms the necessary background for assigning the structures to develop and interpret explicit knowledge. They are mutually dependent and reinforce each other's qualities. However, Frappaolo (2006) pointed out that although both tacit and explicit knowledge are important, tacit knowledge has the potential to be of substantial value to the organization because it is more difficult to capture and diffuse. Many organizations believe that tacit knowledge is more difficult to manage than explicit knowledge, but the most valuable knowledge is tacit (Hauschild, Licht, & Stein, 2001). Knowledge management should manage and acquire tacit knowledge that resides within individuals, as well as explicit knowledge, because tacit knowledge could be critically useful to an organization when it is converted into explicit form and shared with others (Frappaolo, 2006).

Definitions of Knowledge Management

After the field of knowledge management was introduced in the early 1900s, grounding its theoretical background in business and management science, the definition of knowledge management has been debated by practitioners and scholars. Although knowledge management could be seen as a framework that includes systems, procedures, and culture that are used in an attempt to manage valuable corporation assets and knowledge, there is no single definition for knowledge management (Desouza, 2005; Gorelick & Tantawy-Monsou, 2005). Knowledge

management is difficult to define and measure because it is complex, multidimensional, and process-oriented (Gorelick & Tantawy-Monsou, 2005; Iftikhar, 2003; Kumar & Thondikulam, 2005, 2006). Since the main characteristic of knowledge is that it is ever-changing, knowledge management is also changing continuously in response to environmental conditions (Frappaolo, 2006). Although knowledge management has only recently emerged explicitly in the field of organization management, the concept of managing knowledge is not new. Training and employee development programs, organizational policies, routines, procedures, reports, and manuals have served to manage precious knowledge for a long time (Alavi & Leidner, 1999). But the language used to define knowledge management is still nebulous. Table 1 summarizes different definitions of knowledge management in timely manner.

Table 1

Definitions of Knowledge Management

Authors & Year	Definitions of Knowledge Management
Crawford, 1989	"Knowledge management includes maintenance of multiple problem formulations and solutions and administration of the resources used to generate such formulations and solutions" (p. 7).
Wiig, 1997	"The overall purpose of KM is to maximize the enterprise's knowledge-related effectiveness and returns from its knowledge assets and to renew them constantly" (p. 2).
KPMG, 1998	"Knowledge management means a systematic and organized attempt to use knowledge within an organization to transform its ability to store and use knowledge to improve performance" (p. 5).
Allee, 1999	"KM is the manipulation of knowledge objects (such as documents and organized data) and focuses on organizing, sorting, cataloging and delivering those objects throughout the organization" (p. 1).

(continued)

Table 1 (continued)

Authors & Year	Definitions of Knowledge Management
McElroy, 2000	". . . previously viewed KM as little more than information indexing and retrieval, but now sees a new definition emerging – the sustainable creation, transfer, and dissipation of organizational learning" (p. 195).
Büchel & Probst, 2000	"Managing knowledge requires identifying, acquiring, developing, distributing, utilizing and storing knowledge which is meaningful to the organization" (p. 7).
Alavi & Leidner, 2001	"Knowledge management is largely regarded as a process involving …. four basic processes of creating, storing/retrieving, transferring, and applying knowledge" (p. 114).
Marwick, 2001	"[KM is] the set of systematic and disciplined actions that an organization can take to obtain the greatest value from the knowledge available to it" (p. 814).
Jones, 2001	"Knowledge management is much more than technologies for information sharing and collaboration: it also includes the creation and sustainment of communities of practice, coping with behavioral and cultural aspects of people, and creating trusted and validated content" (p. 307).
Zhu, 2004	"KM defined broadly is a loose set of ideas, tools and practices centering on the creation, communication and utilization of knowledge in organizations" (p. 67).
Buckman, 2004	"[KM is the] systematic approaches to help information and knowledge emerge and flow to the right people at the right time to create value" (p. 17).
Gorelick & Tantawy-Monsou, 2005	"KM is a framework that includes systems, procedures, and a culture you put in place to manage one of your more valuable corporate assets – namely, your knowledge" (p. 126).
Milam, 2005	"[KM is the] organized complexity of collaborative work to share and use information across all aspects of an institution which marks the effective use of knowledge" (p. 61).

(continued)

Table 1 (continued)

Authors & Year	Definitions of Knowledge Management
Bhirud, Rodrigues, & Desai, 2005	"Knowledge management is the process of managing the organization's knowledge by means of systematic and organizational specific processes for acquiring, organizing, sustaining, applying, sharing and renewing both tacit and explicit knowledge by employees to enhance the organizational performance and create value" (p. 1).
Chong & Choi, 2005	"Knowledge management is a broad subject with many facets ranging from databases to patents, from the intranet to the mentor, from coldly technical to warmly personal concepts" (p.2)
Frappaolo, 2006	"Knowledge management is the leveraging of collective wisdom to increase responsiveness and innovation" (p. 8).
Sabherwal & Sabherwal, 2007	"The KM process . . . may involve the sharing, application, or creation of knowledge" (p. 411).
Pauleen, Wu, & Dexter, 2007	"KM, which is context embedded, is a particularly culturally dependent process" (p. 4).
Kotelnikov, 2008	"Knowledge management is "collecting, leveraging, and distributing both explicit and tacit knowledge throughout your organization" (p. 1).

The early definitions of knowledge management focused on the capacity to identify, acquire, store, distribute, and use explicitly documented knowledge (Alavi & Leidner, 1999; Allee, 1999; Büchel & Probst, 2000; Von Krogh, 1998). The introduction of networked computers made it possible to codify, store, and share explicit knowledge more easily and cheaply than ever before (Hansen, Nohria, & Tierney, 1999). Many executives invested in information technology and focused on explicit knowledge/information management, and most definitions of knowledge management emphasized the ability to use information technology. The quality of knowledge transfer was significantly improved with the supports of information technologies (Ruggles, 1997). However, researchers and practitioners have realized that

information technology could enable knowledge management processes, but is not a sufficient condition to improve performance and innovation (Khalifa & Liu, 2003). KPMG (1998) reported that many organizations invested in building information technology infrastructures, but many of them failed to utilize information technology in implementing knowledge management. Organizations used information technology only as a solution to store and access information, and knowledge management was isolated from daily business and lacked a strategic or long-term focus (KPMG, 2003). With no link between information technology and knowledge management, many knowledge management projects were doomed to failure because managers did not consider the human aspects of knowledge (Khalifa & Liu, 2003).

The later definitions of knowledge management indicate a movement toward focusing on managing tacit knowledge, emphasizing knowledge sharing, and creating interpersonal interaction (Choi & Lee, 2003; Hansen, Nohria, & Tierney, 1999; Zack, 1999). Despite efforts to acquire knowledge from individuals, most knowledge remains in the human mind; even though it could be the most valuable and intangible asset held by the organization, it is difficult to share with others (Chou, 2005; De Long, 1997; Harris, 2001; Iftikhar, 2003; Nonaka, 1994; Nonaka, Krogh & Voelpel, 2006). The sharing of tacit knowledge could foster innovation and increase organizational effectiveness and performance (Bhirud, Rodrigues, & Desai, 2005; Nonaka& Takeuchi, 1995). Information technology makes it possible to codify, store, and distribute explicit knowledge/information and accelerates the development speed of revolutionary knowledge management, but cannot provide a system to fully support sharing and capturing tacit knowledge of organizational members (Ford & Chan, 2002; Nonaka, 1994). Later definitions of knowledge management include aspects of process, people, culture, as well as technology. The definition of knowledge management is no longer limited to information technology, but

holistically expands to include almost every aspect of an organization (Gold, Malhotra, & Segars, 2001; Iftikhar, 2003).

Moreover, the later definitions emphasized that organizations should be able to create new knowledge through the knowledge management process. Knowledge is created by using processes that convert tacit to explicit knowledge (Nonaka, 1994; Nonaka, Krogh, & Voelpel, 2006; Nonaka & Toyama, 2002; Sabherwal & Becerra-Fernandez, 2003). Nonaka (1994) noted that when organization members externalize, share, articulate, combine and internalize tacit and explicit knowledge, new knowledge will be created. Many researchers and practitioners have concluded that knowledge management must facilitate creating new knowledge in order to make an organization more innovative and competitive (Bhirud, Rodrigues & Desai, 2005; Choi & Lee, 2003; Hsu, 2008; Jones, 2001; Nonaka, Krogh, & Voelpel, 2006; Sabherwal & Sabherwal, 2007; Zhu, 2003). Gorelick and Tantawy-Monsou (2005) stated that knowledge management must be "a vehicle to help individuals, groups, teams, and organizations systematically and routinely to: learn what the individual knows; learn what others know (e.g., individuals and teams); learn what the organization knows; learn what the individual and organization need to learn; organize and disseminate this learning effectively and simply; apply this learning to new endeavors; and create new knowledge" (p. 127).

Examples of knowledge to be managed are best practices, training, customer relations management, business intelligence, project management, document management, search engines, the use of taxonomies, data warehousing, and supply chain management (Milam, 2005). It is important that the knowledge management system be available at the right time to the right persons who require the information, and be presented to them in a format that facilitates their use of the information (Rowland, 2004). In a simplistic sense, knowledge management has two

functions: it is a repository of knowledge and a facilitator for cultivating, nurturing, and exploiting knowledge at both the personal and organizational levels (Gregory, 1999; Milam, 2005).

Definition of Knowledge Management from Diverse Perspectives

Although the meanings of knowledge management involve multifaceted concepts with multidimensional processes, it is possible to sort out overlapping meanings and definitions. Most definitions of knowledge management focus on three components: (a) the work process or activities; (b) a technological infrastructure; and (c) behavioral norms and practices – often labeled as organizational culture.

Knowledge management as a work process or activities.

Many definitions of knowledge management have focused on the work process or activities that create and leverage organizational knowledge. From this perspective, knowledge management is understood to be the processes, systems, procedures, and instruments that support identifying, capturing, and leveraging knowledge (Carvalho & Ferreira, 2001). Milam (2005) defined knowledge management as the "organized complexity of collaborative work to share and use information across all aspects of an institution which marks the effective use of knowledge" (p. 6). Additionally, Marwick (2001) defined knowledge management as "the set of systematic and disciplined actions that an organization can take to obtain the greatest value from the knowledge available to it" (p. 814).

The main focus of knowledge management is to modify the organizational processes and activities to adopt a new market environment by reusing previous experiences and practices (Frappaolo, 2006). Iftikhar (2003) noted that "Knowledge management encompasses the way

that organizations function, communicate, analyze situations, come up with novel solutions to problems, and develop new ways of doing business" (p.57). Knowledge management is the process of capturing and making use of an organization's collective knowledge, both tacit and explicit, anywhere in the business's processes and activities (Kumar & Thondikulam, 2005, 2006; Sabherwal & Sabherwal, 2007). Martin (2003) also defined knowledge management as "the identification and management of processes for leveraging the intellectual capital of an organization over time and place" (p. 1), which can be applied to every business function and process to benefit the organization and its clients. Chong et al. (2000) found that 77% of knowledge management experts agreed that knowledge management is a process to leverage and articulate employees' skills and expertise through support of information technology.

Knowledge management as a technology infrastructure.

The early definitions of knowledge management emphasized the technology infrastructure. Most organizations still invest heavily in the knowledge management infrastructure to collect, manage, and distribute knowledge within the organization more effectively and efficiently (Chinowsky & Carrillo, 2007, p. 122). It would not be effective without information technology support. Knowledge can be created and shared by various means, such as face-to-face interactions, mentoring, job rotation, and either formal or informal training, but as markets and organizations become more global and move to virtual forms, these traditional means may be slow and ineffective, and must be improved through information technology (Alavi & Leidner, 1999). The development of information technology has made it possible to codify, store, share, and disseminate certain kinds of knowledge beyond physical and time barriers more easily and cheaply than ever before (Hansen, Nohria, & Tierney, 1999).

However, there should be no confusion about the differences between knowledge management and information technology. In a contemporary organization, most knowledge is transformed into information through an information management system, and this helps organizational members to transform information into knowledge and knowledge into action (Hansen, Nohria, & Tierney, 1999; Stata, 1989). While information technology plays a pivotal role in the knowledge transferring process, the most important point of this process is encouraging organizational members to use and apply knowledge and to take action beneficially and productively, which can be the whole point of knowledge management (Büchel & Probst, 2000; Iftikhar, 2003; Sanchez, 2005). Although appropriate information technology can enhance the abilities of organizations to share and create knowledge, it cannot guarantee that organizations are managing the right knowledge in the right way (Zack, 1999).

Knowledge management is neither feasible nor effective without the support of information technology; it is provided in diverse forms through information technology (Henderson, 2001). Information technology, which provides a continuous interaction among customers, suppliers, partners, and electronic marketplaces, has had a huge impact on the way people communicate, and is no longer merely an information repository (Henderson, 2001; Roth et al., 2002). It alleviates the temporal, physical, and social distances, and closely ties persons who develop knowledge to those who want the knowledge through virtual person-to-person knowledge sharing (Hansen, Iftikhar, 2003; Nohria, & Tierney, 1999). Information technology alone is not sufficient to explain knowledge management, but it supports knowledge management processes (Khalifa & Liu, 2003). For example, information technology can enhance an organization's ability to share information, exploit knowledge, and collaborate beyond physical distance (Ruggles, 1998), but knowledge management includes much more than these,

including “the creation and sustainment of communities of practice, coping with behavioral and cultural aspects of people, and creating trusted and validated content” (Jones, 2001, p. 307).

Knowledge management as organizational culture.

Finally, experts view knowledge management as behavioral norms and practices or organizational culture, “a set of valid knowledge, created and shared by a group of people, to solve the problems they face in their environment” (Pauleen, Wu, & Dexter, 2007, p. 5). Organizational culture has become critically important in the contemporary business environment and can affect performance through its influence on the organization’s ability to implement change either directly or indirectly (Cummings & Worley, 2005).

The organizational culture may be defined as “underlying values, beliefs and principles that serve as a foundation for the organization’s management system, as well as the set of management practices and behaviors that both exemplify and reinforce those principles” (Denison, 1990, p. 2). De Long (1997) identified three aspects of organizational culture: values, norms, and practices. Values are members’ beliefs about what is worth doing and having, whereas norms are shared beliefs about how they should behave or what they should do to accomplish their work. Practices are either formal or informal routines to accomplish work, including project implementation processes, team meetings, time sheets, career paths, compensation plans, as well issues such as informal dining.

Since organizational culture reflects values, beliefs, principles, and behaviors within an organization, it is clearly linked with effective knowledge management (Iftikhar, 2003). It has been proven that various approaches and tools used for knowledge sharing and teamwork would have failed without the supportive organizational culture (Suresh, 2002). Many researchers and practitioners agree that knowledge management should be supported by a knowledge-sharing

culture (Chong et al., 2000; Hauschild, Licht, & Stein, 2001; Iftikhar, 2003; Martin, 2003; Pauleen, Wu & Dexter, 2007). Knowledge management is a context-embedded and particularly culturally dependent process (Pauleen, Wu, & Dexter, 2007). Ford and Chan (2002) asserted that companies that wish to gain a greater competitive advantage through knowledge management must create a culture and environment in which knowledge sharing will prosper. De Long (1997) noted that: "Organizational knowledge and culture are intimately linked, and that improvements in how a firm creates, transfers, and applies knowledge are rarely possible without simultaneously altering the culture to support new behaviors" (p. 2). However, in general, since each organization has a unique organizational culture, it is important for a company to understand its own organizational culture because it may act as a barrier or enabler for knowledge management (Iftikhar, 2003; Yen, 2001).

One of the main issues facing those charged with implementing knowledge management is to change the attitudes of people within the organization (Suresh, 2002). In the traditional organizational culture, knowledge was regarded as power used by a person to survive, adapt, and thrive in a harsh environment, so very few people were willing to share knowledge with others (Buckman, 2004; Suresh, 2002). However, individualism cannot support the current knowledge-based environment.

Knowledge Management Capabilities

Knowledge has become one of the few sustainable sources of competitive advantage and is critical in today's global economy. Certain specific knowledge can have a great impact on a firm's success, and is an asset that differentiates it from its competitors. Knowledge has been considered as the main source for creating organizational core capabilities, and as the basis for

sustainable profitability (Grant, 1996). The success of a knowledge-based organization depends hugely on how effectively the organization handles knowledge.

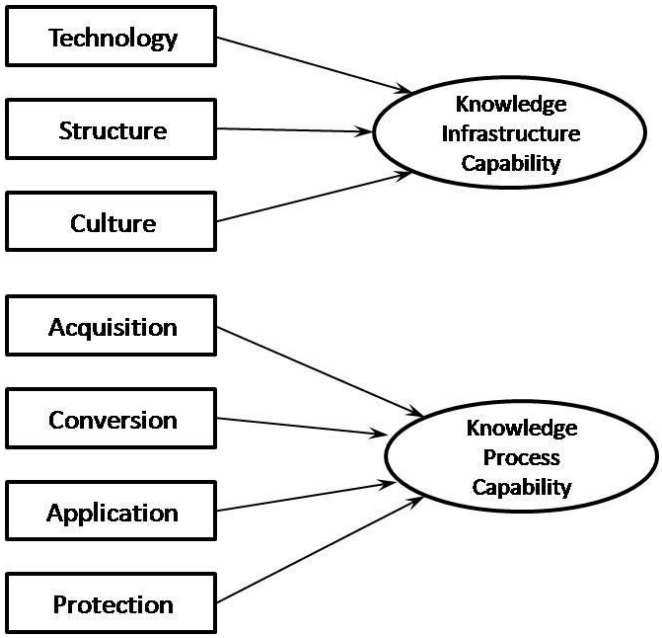

Figure 5. The original framework of Knowledge Management Capabilities (Gold, 2001).

Organizational capability is "a firm's capacity to deploy resources, usually in combination, using organizational processes, to affect a desired end" (Amit & Schoemaker, 1993, p. 35). Grant (1991) maintained that "Capabilities involve complex patterns of coordination between people and between people and other resources" (p. 122) and submitted that a capability is essentially a routine or a combination of interacting routines. An organizational routine is a regular and predictable pattern of coordinated actions, and the organization itself can be viewed as a huge network of routines. The term knowledge management capabilities refers to an organization's capabilities to recognize, create, transform, and distribute knowledge (Gold, 2001; Gold et al., 2001). Also, Dawson (2000) defined knowledge management capabilities as the

ability to deploy knowledge resources effectively and implement knowledge processes efficiently to derive organizational benefits.

The shift that takes information management into the realm of knowledge management is a complex undertaking that involves the development of abilities that allow an organization to recognize, create, transform, and distribute knowledge (Gold, 2001). In their model of knowledge management capabilities, Gold, Malhorta, and Segars (2001) used two aspects of knowledge management capabilities: knowledge infrastructure capability and knowledge process capability (Figure 5).

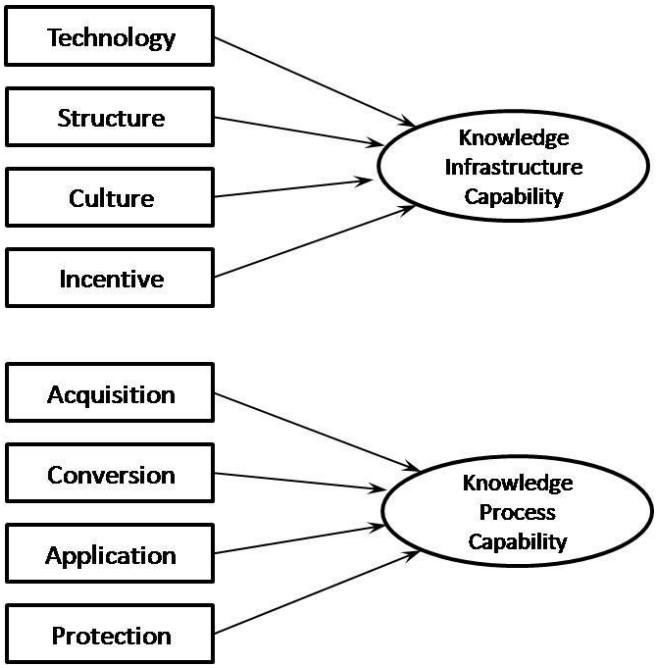

Figure 6. The modified framework of Knowledge Management Capabilities.

Knowledge infrastructure capability.

Knowledge infrastructure management provides the infrastructural environment, either IT or non-IT, that supports knowledge-creation and -sharing capabilities (Carrillo, Robinson, Anumba, & Al-Ghassani, 2003). Davenport, De Long, and Beers (1998) noted that organizations that built effective technical and organizational infrastructures were more likely to implement

successful knowledge management projects. Gold, Malhotra, and Segars (2001) identified three key building blocks of knowledge infrastructure capability: technology, structure, and culture. In addition, because knowledge management processes often require a certain amount of time and effort, it is important that an organization rewards properly those who support efforts towards knowledge management (Iftikhar, 2003). Incentives are an effective motivator to encourage people to participate in the knowledge management processes, and an organization must use its incentives efficiently. In this context, the fourth aspect of knowledge infrastructure capability, incentives, are included in the original knowledge management capabilities framework (Figure 6).

Technology.

Technology is one the most important enablers of the active knowledge management processes. Gold, Malhotra, and Segars (2001) stated that "Technology comprises a crucial element of the structural dimension needed to mobilize social capital for the creation of new knowledge" (p. 187). The concept of social capital emphasizes that "Networks of relationships are valuable resources supporting any social affair by crediting all individuals with a collectively owned capital" (Vandaie, 2007, p.1). Although technology alone is not sufficient to directly affect knowledge management success, it is an essential foundation for the improvement of knowledge management capabilities (Iftikhar, 2003; Khalifa & Liu, 2003). It is clear that technology enables and supports core knowledge activities such as knowledge creation, knowledge sharing, knowledge distribution, and knowledge application (Gold, Malhotra, & Segars, 2001).

Ruggles (1997) classified technology into three general categories based on its purposes: generation, codification, and transfer. Knowledge generation tools enable the acquisition,

synthesis, and creation of knowledge; codification tools help to codify both tacit and explicit knowledge into a transferable form that can be accessed and transferred. Transfer tools alleviate the temporal, physical, and social distances in knowledge sharing and distribution. Examples of information technology are search and retrieval engines; Internet, intranet, and Web browsers; internal and external content repositories; content management systems; data warehouses; workflow systems; electronic news; real-time news feeds; automatic content classification; data mining; knowledge mapping; groupware; and collaboration tools. However, those tools are suboptimized if they are not supported by other knowledge management enablers such as organizational culture, structure, and business strategy (Chong et al., 2000; Hsu, 2008; Iftikhar, 2003; Sanchez, 2005).

Organizational structure.

Organizational structure is "the design of organizational work flow and processes," as well as "the pattern of interrelationships among key components of the system" (Senge, 1994, p. 90). The organizational structure usually takes the form of organizational norms, culture, communication methods, incentive systems, and corporate policies that affect individual behavior within an organization (Hansen, Nohria, &Tierne, 1999; Orlikowski, 1992; Suresh, 2002). Since the organizational structure can affect individual behavior, it should be designed to support effective knowledge flow and transfer (Casselman & Samson, 2007; Iftikhar, 2003; Walker, 2006). Additionally, the organizational structure attempts to divide tasks among members and arrange the coordination of their different task activities, and, during this process, knowledge is transferred, shared, and created (Nonaka, von Krogh, & Voelpel, 2006; Vera & Crossan, 2004). The organizational structure should be strategically designed to support knowledge activities because unintended structural barriers exist that hinder knowledge creation

and sharing (Nonaka, 1988; Suresh, 2002). There are two major structural barriers, multilevel structure and horizontal communication, that occur when there are no economic and administrative links (Zeng, Lou, & Tam, 2007).

There is a tendency in contemporary organizations to transform their structures from traditional bureaucracies to more radical virtual corporations and hypertext organizations in which knowledge is an essential part of the organization (Suresh, 2002). In the formal type of organizational structure, information and knowledge for making organizational decisions usually flow vertically. Often, the information and knowledge does not move horizontally; rather they go up to upper management and down to other horizontal sites. In the latter type of organizational structure, information and knowledge flow both vertically and horizontally (Iftikhar, 2003). It is important that the organizational structure be flexible enough to encourage sharing and collaboration across boundaries within the organization and across the supply chain (Gold, Malhotra, & Segars, 2001).

Organizational culture.

Every organization has its own culture that influences the way people work. Denison (1990) defined organizational culture as the "underlying values, beliefs and principles that serve as a foundation for the organization's management system, as well as the set of management practices and behaviors that both exemplify and reinforce those principles" (p. 2). Additionally, the American Productivity & Quality Center (APQC; 1999) defined organizational culture as "the environment that influences behavior; decision making; and the organization's approach to markets, customers, and suppliers" and "the combination of shared history, expectations, unwritten rules, and social mores that affects behavior throughout the organization" (p. 6). Because the organizational culture includes values, norms, assumptions, and other observable

behaviors, it is important to promote and modify organizational culture in order to affect desirable outcomes (Cox, 1993; Khan, 2005). The topic of organizational culture has become critically important in contemporary organizations, and the transforming of that culture would be the most common form of organizational transformation. Buckman (2004) stated that installing hardware and software is absolutely not enough to support innovative and productive organizational changes, but doing so is necessary to bring about cultural changes.

In a knowledge-based economy, most organizations attempt to promote a knowledge-sharing culture so that they can react quickly to key issues and gain more competitive advantages (Chong et al., 2000). De Long (1997) stated that "Organizational knowledge and culture are intimately linked, and improvements in how a firm creates, transfers, and applies knowledge are rarely possible without simultaneously altering the culture to support new behaviors" (p. 2). Knowledge management is a particularly culturally dependent process (Gold, Malhotra, & Segars, 2001; Iftikhar, 2003; Pauleen, Wu, & Dexter, 2007). Cultural factors include corporate visions, mission statements, rewards, and information services, and they should be effectively aligned to facilitate a sharing culture (Chong et al., 2000).

Organizational culture is one of the most powerful influences on behavior, and it can enable or hinder knowledge management (Cummings & Worley, 2005; Iftikhar, 2003). For example, a commonly shared culture can contribute significantly to an organization's effectiveness under stable conditions, but in a fast-changing environment, a strong culture can inhibit organizational flexibilities and changes (Cummings & Worley, 2005). Additionally, since people recognize that knowledge is power, they might not be willing to give up or share power, so an organizational culture must promote the sharing rather than the hoarding of knowledge (Suresh, 2002).

Incentives.

In a typical organization, there are both knowledge providers and knowledge seekers. In an optimized knowledge-based organization, knowledge providers should make knowledge accessible to knowledge seekers whenever they need it. Since knowledge has become an important source of competitive advantage in the economy, it is critical to identify the means to manage and motivate employees to share their knowledge (Wolfe & Loraas, 2008). Several researchers agree that sharing organizational knowledge increases proportionately as appropriate incentives motivate and encourage employees to do so (APQC, 2001; Devenport & Prusak, 1998; Gammelgaard, 2007; Hauschild, Licht, & Stein, 2001; Stajkovic & Luthans, 2001; Wolfe & Loraas, 2008). People often need incentives to participate in the knowledge-sharing process (Hansen, Nohria, & Tierney, 1999). However, converting knowledge into a shareable format involves cost, effort, and time, so potential knowledge providers are often not willing to share their knowledge unless they are rewarded for it directly (Evaristo, 2005; Suresh & Mahesh, 2006). If there is no standardized incentive system for knowledge providers, knowledge transfer and sharing is unlikely to occur on an ongoing basis. Moreover, standardized incentive-systems help institutionalize the knowledge-sharing behavior so that it becomes common in the organizational culture (APQC, 2001).

In general, there are two types of incentives: monetary and nonmonetary (APQC, 2001; Gammelgaard, 2007; Stajkovic & Luthans, 2001; Wolfe & Loraas, 2008). Monetary incentives include money, promotions, considerable gifts, bonuses, and anything that costs organizations financial resources (Stajkovic & Luthans, 2001). Nonmonetary incentives include social recognition, acknowledgement from colleagues, improved reputation, performance feedback, and the possibilities of professional or personal development (Gammelgaard, 2007; Stajkovic &

Luthans, 2001). A study by Wolfe and Loraas (2008) concluded that: "monetary and nonmonetary incentives should motivate knowledge sharing equivalently dependent on perceived incentive sufficiency" (p. 56), and emphasized that nonmonetary incentives are not as strong as monetary ones in attempting to bring about full knowledge sharing. On the other hand, Stajkovic and Luthans (2001) stated that social recognition, such as positive reactions of relevant others, could lead to future rewards that are mostly material, such as promotions and salary raises. In general, people try to get more social recognition and avoid behaviors that lead to the disapproval of others. They also empirically found that monetary incentives could improve organizational performance 31.7%, social recognition, 24%, and performance feedback, 20%.

No matter what types of incentives are used, they should motivate and encourage knowledge sharing, improve productivity, and reinforce desirable day-to-day behaviors (APQC, 2001; Evaristo, 2005; Gammelgaard, 2007; Sanchez, 2005; Stajkovic & Luthans, 2001; Suresh, 2002; Wolfe & Loraas, 2008). It is critical that the appropriate incentive system be congruent with existing knowledge management policies and processes as well as organizational culture (Walker, 2006).

Summary of knowledge infrastructure capability.

Knowledge infrastructure capability is comprised of technology, structure, culture, and incentives, which represent the organizational infrastructural environment to serve the knowledge management process of encouraging knowledge sharing. Knowledge infrastructure capability is deeply related to balancing people and technology; establishing and cultivating a knowledge environment; combining technology and organizational design; managing tacit knowledge; and establishing flexible and modular organizational structure (Gold, 2001).

However, knowledge infrastructure capability alone would not be enough to maximize the knowledge management processes.

Knowledge process capability.

Knowledge process capability is essential to leverage the knowledge management infrastructure capability, and should be conducted frequently, consistently, and flexibly for optimizing knowledge management activities (Grant, 1996; Khalifa & Liu, 2003). Knowledge management process capability not only includes obtaining necessary information and knowledge, but is also a tool for maintaining information and knowledge effectively to support employees' efforts to work better (Fan et al., 2009). Knowledge process capability includes four sub-processes: acquisition, conversion, application, and protection.

Acquisition.

The acquisition aspect of knowledge management relates to obtaining knowledge. Gold (2001) noted that the process of acquiring knowledge includes: seeking, generating, creating, capturing, and collaborating on knowledge. However, the main purpose is to acquire knowledge. Knowledge acquisition can be referred to as the creation of a knowledge base, which requires capturing knowledge from experts' minds (Milton, 2007). The knowledge base can be presented in various ways, such as a knowledge store, a knowledge repository, or an ontology, and recently, information technology. Milton (2007) defined knowledge acquisition as "the activity of capturing expertise from people (and other sources of knowledge) and creating a computerized store of this knowledge to be used to help an organization in some specified ways" (p. 1).

The organization learns when information is acquired outside the boundaries of the company and when individuals externalize tacit into explicit knowledge to be shared, and then integrates that into the existing knowledge base (Büchel & Probst, 2000; Nonaka, Krogh, &

Voelpel, 2006). The organization can acquire knowledge either externally or internally. External knowledge may be acquired from relationships with customers, suppliers, competitors, and partners. The organization can also buy external knowledge by recruiting experts or through a merger and acquisition (Büchel & Probst, 2000). Meanwhile, individuals may acquire knowledge by observing, experiencing, imitating, practicing, and interacting with others. Internal knowledge acquisition could refer to finding hidden knowledge that is already within the organization, by capturing exporting it to other organizational members. Knowledge management must be designed to encourage members to participate in the knowledge acquisition processes, creating an opportunity for future business and competitive advantages.

Conversion.

Gold, Malhotra, and Segars (2001) described the knowledge conversion process as "making existing knowledge useful" (p.191). One of the critical purposes of knowledge management is to exploit the knowledge inherent in the company in an effective manner (Iftikhar, 2003). The process should store, transform, and transport information throughout the organization, to enable the organization to capture, exploit, and transfer knowledge in an effective way (Gold, Malhotra, & Segars, 2001; Iftikhar, 2003; Nonaka, Toyama, & Konno, 2000).

Much useful knowledge is not revealed, and if it is not utilized, it will be wasted. Knowledge management should support the conversion of data to information and information to knowledge (Bhatt, 2001; Büchel & Probst, 2000; Sanchez, 2005). Chunks of data and information have little value if they are not reflected, interpreted, and learned by individuals based on their contextual situations (Alavi & Leidner, 2001; Cohen, 1998). However, an organization should not overly focus on the conversion process from data and information to

knowledge, and neglect the process of conversion from knowledge to information and information to data. The conversions among data, information, and knowledge are cyclical and transitory (Bhatt, 2001). When knowledge is no longer valid in the existing context, the organization should transform it into information and data to store in its knowledge management system, or simply discard it.

Additionally, most knowledge in an organization remains in an individual's mind in the form of tacit knowledge. To be useful, it must be converted into explicit knowledge, available to share with those who need it (von Krogh, 1998). Nonaka (1994) emphasized the knowledge conversion process between tacit and explicit knowledge, meaning it can be shared and used to create new knowledge. When individuals share, articulate, combine, and internalize tacit and explicit knowledge with others, new knowledge is created, and organizational members learn. Nonaka (1994) identified four knowledge conversion processes: socialization, externalization, combination, and internalization.

During the *socialization* process, tacit knowledge held by one individual is handed over, and becomes the tacit knowledge of another (Nonaka, 1994; Nonaka, von Krogh, & Voelpel, 2006). The main characteristic of this mode is experience because it is impossible to share an individual's thinking process without the medium of shared experience (Nonaka, 1994). Utilizing *externalization*, each individual converts some proportion of his/her tacit knowledge into explicit knowledge by conceptualizing and articulating it (Marwick, 2001; Nonaka, 1994; Nonaka, von Krogh, &Voelpel, 2006). This *combination* process includes explicit to explicit knowledge, "the reconfiguring of existing information through the sorting, adding, recategorizing, and recontextualizing of explicit knowledge" (Nonaka, 1994, p. 19). An organization tries to combine and exchange explicit knowledge through the mechanisms of

exchange, including dialogue, team meetings, telephone communication, and communication through information technology (Nonaka, 1994). The last process is *internalization*, that is, the conversion process from explicit to tacit knowledge. Using internalization processes, an individual absorbs knowledge that others hold, and converts it into actions and practices that are deeply related to tacit knowledge (Sabherwal & Becerra-Fernandez, 2003). In some sense, the internalization process is similar to the traditional notion of learning (Nonaka, 1994).

The development of information technology has accelerated knowledge conversion processes, tacit to explicit and explicit to tacit. Individuals understand and absorb explicit knowledge to create their own tacit knowledge, which makes explicit knowledge ready to use by the knowledge owner. Usually, knowledge about a particular subject may spread throughout the organization, so "combining or integrating this knowledge reduces redundancy, enhances consistent representation, and improves efficiency by eliminating excess volume (Gold, Malhotra, & Segars, 2001, p. 191).

Application.

Simply put, knowledge application denotes the actual use of knowledge within the organization. It involves making knowledge more active and relevant to create more value (Bhatt, 2001). Knowledge becomes useful to an organization only when it is applied in action within an organization's processes, and otherwise it will be wasted (Sanchez, 2005). Knowledge management must ensure that knowledge is actually used and exploited in effective ways to create value. Sanchez (2005) stated, "The basic goals of knowledge management practice are not just generating new knowledge but also assuring that new and existing knowledge is actually applied in all processes where the knowledge can be used throughout an organization" (p.12). When knowledge is effectively applied, an organization can improve its efficiency and reduce

costs (Davenport & Klahr, 1998). If an organization fails to locate the right knowledge to use in the right situations, it may lose its competitive advantage.

Major activities associated with the knowledge application are identification, storage, imitation, retrieval, application, dissemination, contribution, learning, sharing, and creation of knowledge (APQC, 1999; Bhatt, 2001; Gold, Malhotra, &Segars, 2001; Harris, 2003; Iftikhar, 2003; McElroy, 2000; Nonaka, 1994). The ultimate goal of knowledge management is not only to facilitate the creation of new knowledge but also to help the organization to apply it productively for its benefit (Büchel & Probst, 2000).

Protection.

Organizations expend immoderate amounts of resources to protect minor physical properties such as desks, chairs, phones, and office supplies, while often neglecting their most valuable assets: knowledge resources. The U.S. Chamber of Commerce estimates that U.S. companies lose at least $25 billion of intellectual property per year due to corporate espionage (Desouza, 2007). Knowledge assets must be protected from competitors in order for an organization to remain competitive (Desouza & Vanapalli, 2005, p. 77).

Knowledge protection means having security-oriented knowledge management processes "designed to protect the knowledge within an organization from illegal or inappropriate use or theft" (Gold, Malhotra, & Segars, 2001, p. 192). In the contemporary business environment, employees use various devices to communicate and share knowledge, such as phones, e-mail, computers, and instant messengers. In this environment, where employees use heterogeneous devices over heterogeneous environments, it is particularly difficult to secure knowledge (Desouza, 2007).

Additionally, since the economy has become globalized and complex, it is necessary to ally with several business partners to satisfy complex customer needs. Organizations must not only secure their own knowledge assets, but also insure that their business partners have adequate security protocols in place (Desouza & Vanapalli, 2005). To prevent the knowledge leakage, organizations must know how their knowledge is used and stored by their business partners and be aware of who has access to it.

Summary of knowledge process capability.

Knowledge process capability comprises the main precondition of knowledge management processes, such as acquisition, conversion, application and protection of knowledge. The aspects of knowledge process capability are related to abilities to integrate, coordinate, acquire, create, apply, organize, convert, retain, and protect knowledge (Gold, 2001). Knowledge process capability should be coordinated with knowledge infrastructure capability for optimizing knowledge management results.

Organizational Performance Measurement

Kanji and Sá (2002) found "Effective management depends on the effective measurement of performance and results" (p. 13). Organizational performance is the result of several business factors, including work processes; team/group communication and interaction; corporate culture and image; polices; leadership; and a climate that promotes innovation, creativity, and loyalty (Haworth, 2007). The definition of performance measurement is "a process of assessing progress toward achieving predetermined goals, including information on the efficiency with which resources are transformed into goods and services (outputs), the quality of those outputs (how well they are delivered to clients and the extent to which clients are satisfied), outcomes (the

results of a program activity compared to its intended purpose), and the effectiveness of government operations in terms of their specific contributions to program objectives" (U.S. Department of Energy, 2005, p. 7). There are financial and nonfinancial aspects to the measurement of organizational performance. The financial aspects of organizational performance, such as net earnings and returns on investment are related to pursuing short-term fixes over long-term strategic goals, whereas the nonfinancial aspects are related to product quality, work processes, and customer satisfaction. Nonfinancial aspects are often subjective and susceptible, so it is difficult to control and manage those (Andrews, 1996).

Because the nonfinancial aspects of organizational performance are difficult to manipulate, many organizations have neglected them and focused on the financial aspects of organizational performance. However, focusing only on the financial aspects might hinder continuous improvement and innovation because they alone cannot provide a clear performance target or focus attention on the critical areas of the business (Kaplan & Norton, 1992, 1996). One of the leading measurement tools for organizational performance is the Balanced Scorecard, which includes both a financial measurement that can reveal the results of actions already taken, and nonfinancial measurements to supplement the financial measurements, which can drive future financial performance (Kaplan & Norton, 1992).

The Balanced Scorecard.

The Balanced Scorecard is a performance management tool that has been in use for more than a decade. The Balanced Scorecard was invented by Robert Kaplan and David Norton, who published information about it in 1992 to inform organizations (Niven, 2002). It is an essential performance measurement approach that focuses on the internal as well as external performance indicators of the organization. Therefore, the Balanced Scorecard is an important tool for

monitoring organizational strategic goals and the feasibility of achieving these goals (Huang, 2009; Kaplan & Norton, 1996, 2001a). The Balanced Scorecard continues to play a role as a successful performance measurement tool in most organizations, as it succinctly measures the four aspects of an organizational performance.

Various researchers and practitioners have sought a definition of the Balanced Scorecard. Kaplan and Norton (1992) noted that it not only comprises the financial measures that tell the results of actions already taken, but also operational measures of customer satisfaction, internal business processes, and organizational innovation and improvement, which drive future financial performance. Niven (2002) defined the Balanced Scorecard as "a tool for leaders to use in communicating to employees and external stakeholders the outcomes and performance drivers by which the organization will achieve its mission and strategic objectives" (p. 12). Niven (2002) viewed the Balanced Scorecard as not only a measurement system but also a strategic management system and communication tool, and emphasized the importance of the word "balance," which represents the equilibrium between financial and nonfinancial indicators, internal and external constituents of the organization, and lagging and leading indicators.

The balance between the financial and nonfinancial indicators suggests that the Balanced Scorecard was originally invented to overcome insufficiencies of the traditional performance measurement tools by balancing them with nonfinancial drivers for future performance (Niven, 2002). The financial measures cannot entirely support today's business environment; rather, nonfinancial assets, business relationships, and organizational competencies and capabilities contribute to the prospects for success (Kanji & Sá, 2002; Kaplan & Norton, 1996). Nonfinancial indicators have become more important in measuring organizational business performance (Kanji & Sá, 2002). Kaplan and Norton (2001b) maintained that no single measure can provide a

performance target or focus on the critical areas of business, but managers should be able to measure their organizational performance in several business areas when the business environment is complex. The balance between internal and external constituents of the organization indicates that the Balanced Scorecard is the performance measure that balances the internal as well as the external aspects against the finances and the innovation of the organization (Niven, 2002). The internal aspects of the organizational performance include all organizational activities and processes directly linked to the achievement of organizational goals and objectives.

However, the external aspects of the organizational performance concern the customer-related issues or the customer's perspective (Meyer, 2002; Niven, 2002). Finally, the balance between lagging and leading indicators means that by balancing lagging indicators, past performance, and leading indicators, one finds "the performance drivers that lead to the achievement of the lagging indicators" (Niven, 2002, p. 23). Examples of the lagging indicators are customer satisfaction or revenue, which are already explicit and accessible, and usually lack any predictive power. Conversely, the leading indicators are often measurements of processes and activities, which track performance before a problem arises (Smith, 2006). The leading indicators often tell us about how to manage a part of the business and provide prompt feedback when a poor result is found. While the lagging indicators do indicate how well a business has been managed, there are few opportunities to identify reasons for the underperformance. For example, on-time delivery would be the leading indicator, and customer satisfaction would be a lagging measure of this.

The Balanced Scorecard is not merely a collection of financial and nonfinancial measurements, but it represents a translation of business unit strategy into a linked set of mechanisms for achieving and obtaining feedback regarding those objectives (Kaplan & Norton,

1996). Huang (2009) noted that the Balanced Scorecard is a comprehensive assortment of financial as well as nonfinancial data that are given to managers to help them facilitate the achievement of the organizational goals. Rampersad (2006) submitted that the Balanced Scorecard empowers managers by giving them the relevant tools and information that help them establish the core goals of the organization and thus help them to achieve them in a more feasible manner. Thus, the Balanced Scorecard is an important tool for monitoring the organization's strategic goals and the feasibility of achieving these goals. Companies that create the Balanced Scorecard could integrate their strategic planning and budgeting processes, which helps to ensure that their budgets support their strategies (Kaplan & Norton, 1996). It is also an effective communication tool that helps managers to achieve strategic alignment and planning and align individuals and processes with organizational strategy (Huang, 2009).

According to Smith (2006a), the Balanced Scorecard provides an integrated management method primarily based on certain key performance indicators that outline the prime description of the Balanced Scorecard parameters. In addition, the key performance indicators facilitate the analysis of the organization's strategy, which encompasses both its internal and external organizational aspects (Kaplan & Norton, 1992; Niven, 2002; Smith, 2006a). Rigsby and Greco (2003) found that the Balanced Scorecard is a performance measurement system that compares and contrasts an organization's performance against previous benchmarks by relying on certain key performance indicators, including financial, customer, business process, and learning & growth perspectives, which encompass all of the various aspects of the Balanced Scorecard as an effective performance measurement tool. By combining these key performance indicators, the Balanced Scorecard can help managers understand numerous interrelationships and causal effects (Huang, 2009).

Lawson, Hatch, and Desroches (2008) viewed the Balanced Scorecard differently, submitting that organizational performance measures do not necessarily move along the same axis as the organizational mission and vision in either the short- or long-term. The Balanced Scorecard can be defined as the measurement tool that primarily measures the unit performance before cohesively connecting it to organizational performance. Lawson, Hatch, and Desroches (2008) suggested that the first step should be to determine the organizational performance at the unit level before connecting these measurements to the entire organizational performance.

The four aspects of the Balanced Scorecard.

Kaplan and Norton (1992; 1996) submitted that the Balanced Scorecard enables managers to look at the business from four key performance aspects: financial, customer, internal business, and innovation and learning. The Balanced Scorecard can answer key questions related to the four key performance indicators:

- How do customers see us?
- In what areas must we excel?
- Can we continue to improve and create value?
- How do we look to shareholders? (Kaplan & Norton, 1996, p. 84)

Kaplan and Norton (1996) noted that the four key performance perspectives are associated with cause-and-effect relationships, which help managers understand numerous interrelation-ships and causal effects (Huang, 2009; Kaplan & Norton, 1992; Niven, 2002; Rampersad, 2006). The Balanced Scorecard can be a performance management system that facilitates the achievement of the organization's goals using the four perspectives (Niven, 2002), which represent a more holistic view of the organization.

The customer-related aspect of organizational performance.

A company must invest money and effort into building strong relationship with its customers for the sake of its prosperity and survival. A strong positive relationship with customers is essential in building a successful company. The customer-related perspective is an external perspective because it basically relates to the external customers of the organization, and, until recently, it was not considered to be an important performance measurement indicator (Kaplan & Norton, 1996; 2001a; 2001b). Without this perspective, an organization might be prevented from differentiating itself from competitors (Niven, 2002). The major purposes of the customer-related perspective are about how the firm is viewed by its customers and how well it serves its customers in order to meet organizational objectives (Huang, 2009; Kaplan & Norton, 1996). Ehlers and Lazenby (2004) stated that poor performance exhibited by customer dissatisfaction is a major indicator of future decline even though the current financial outlook may look promising. Therefore, the value of the customer perspective should never be underestimated. The outcomes of the customer perspective include "market share in specific customer segments, account sharing with targeted customers, acquisition and retention of customers in targeted segments, and customer profitability" (Huang, 2009, p. 211).

For measuring the customer-related perspective, Niven (2006) recommended approaching it in three value indicators: operational excellence, product leadership, and customer intimacy. *Operational excellence* may refer to an organization's exertion to reduce its inefficiency and defects and to excel in great value and quality. For example, an organization that excels in operational excellence can provide its services/products at a lower price than its competitors, without any defects, while providing better selection and convenience to its customers. *Product leadership measures* could be achieved by providing innovative

services/products that distinguish it in the marketplace. Often services/products of the market-leading organizations have cutting-edge design, style, and functionality. Lastly, *customer intimacy measures* are related to the relationship between an organization and its customers. The organization must satisfy its customers by investigating their needs and dissatisfaction, and by providing adequate solutions.

The internal business aspect of organizational performance.

Kaplan and Norton (1992) noted that "customer-based measures are important, but they must be translated into measures of what the company must do internally to meet its customers' expectation" (p. 5). Excellent customer service usually emanates from internal business processes, decisions, and actions occurring throughout an organization. Rampersad (2006) indicated that the metrics of the internal business performance allow managers to determine how well the company is running. Smith (2006a) agreed that the internal business process perspective can define the current business process and its contributions to the organization's success. Therefore, companies should attempt to identify and measure their core business competencies and critical technologies and decide which of those will lead them to excel in the market (Kaplan & Norton, 1992; 1996). The successful implementation of strategic initiatives in key business process perspectives can lead to successful financial results (Kanji & Sá, 2002). One of the major assumptions of this perspective is that employee capabilities can drive internal business process improvement (Huang, 2009).

The measures of the internal business perspective are about processes, decisions, and actions occurring throughout the organization to meet its customers' expectations (Kaplan & Norton, 1992). Niven (2006) provided four measures for the internal business perspective: operations management, customer management, innovation, and regulatory and social.

Operations management measures are related to the aspects of basic, routine, and day-to-day processes related to company's core competencies, for example, quality control processes, cycle time from application to funding, throughput time, and planning processes (Niven, 2006). *Customer management measures* are slightly different from the customer-related perspective, because the latter deals more with how the customers see us, which can be the external perspective. However, *customer management measures* are more related to the internal process of how the organization can expand and deepen the relationship with its customers, such as customer segmentation or classification, marketing effectiveness, how to reach the target customer, etc. Moreover, the internal business measures should contain the aspects of innovation. *Innovation measures* are related to creating and supplying new products and services to surpass competitors. Examples of measures for this perspective would be dollars spent on R&D, numbers of new products or services in the pipeline, etc. Lastly, *regulatory and social measures* are about how to establish good relations with external stakeholders.

The learning & growth aspect of organizational performance.

The learning & growth perspective deals with intangible aspects of the organizational performance. A competitive business environment requires organizations to transform themselves and learn continuously because companies' core competencies are no longer valid in a constantly changing business environment. New threats and opportunities arise constantly, so companies must be able to learn and innovate (Kaplan & Norton, 1996). Intense global competition requires that "companies make continual improvements to their existing products and processes and have the ability to introduce entirely new products with expanded capabilities" (Kaplan & Norton, 1992, p. 6). The ability to innovate, improve, and learn is directly related to the company's value, and this ability leads to the launch of new products, creates more values for

customers, and improves operating efficiencies, which can lead to penetrating new markets and increasing revenues and margins (Kaplan & Norton, 1992).

Learning & growth perspectives indicate the ability of employees, information systems, and organizational alignment to manage a business and adapt to change (Huang, 2009). Niven (2006) provided three aspects to be considered to measure learning & growth perspectives: human capital, information capital, and organizational capital measures. *Human capital measures* are about developing employees' competencies and skills, and how they are related to the employees' productivity. *Information capital measures* deal with whether an organization provides its employees with certain physical and intangible tools, and certain access to information to get their job done. *Organizational capital measures* are concerned with employee satisfaction, alignment between employees' and organizational strategy, and a healthy lifestyle.

The financial aspect of organizational performance.

The financial performance perspective indicates "whether the company's strategy, implementation, and execution are contributing to bottom-line improvement," and the typical financial goals are profitability, growth, and shareholder value (Kaplan & Norton, 1992, p. 7). Since the financial performance measurements document inadequacies through a backward-looking focus and do not reflect contemporary value-creating actions, many researchers and practitioners have criticized it (Kaplan & Norton, 1996). Nonetheless, it is an important perspective provided by the Balanced Scorecard, especially for profit-making organizations. Well-designed financial control systems can actually enhance an organization's total quality management program (Kaplan & Norton, 1992). Brown (2007) reported that the financial perspective is directly related to: organizational sales volume, growth in revenue, entry of new customers, and growth in financial objectives. This relationship implies that growth in income

and revenues can be translated to overall organizational growth. Thus, the financial perspective is a straightforward performance measurement tool that measures not only the revenue growth but also incorporates aspects of intangible growth that has financial consequences such as the acquisition of new customers and increase in sales prospects and market share (Brown, 2007).

Tobin's q as measuring organizational performance.

Tobin's *q* was developed by James Tobin (1969), and refers to the ratio that compares the market value of company's stocks with the its equity book value. It can be calculated through division of market value of the company with the replacement value of the book equity. The basic formula is provided below (Smirlock, Gilligan, & Marshall, 1984).

$$\text{Tobin's q} = \frac{\text{Market value of equity + Book value of liabilities}}{\text{Book value of equity + Book value of liabilities}}$$

This equation also helps to determine the valuation of the market in totality; the formula applicable for this would be: *q* = stock market value/net worth of the corporation. The Tobin's *q* ratio helps a company determine whether it is over- or undervaluing its assets.

Generally, Tobin's *q* would be expected to be 1.0 because the market value exactly reflects the book value of incorporation (Salinger, 1984). However, when the market value is greater than the value of recorded assets of company, Tobin's *q* is greater than 1.0, which could indicate that the market value reflects unrecorded or unmeasured company assets. Therefore, financial companies would invest more in capital when the Tobin's *q* ratio is high, because investing in such capital is more worth than the price the companies pay for them. However, a ratio of less than 1.0 implies that market value of the assets is less than the recorded value by the firm. In this case, the market is undervaluing the assets of the company.

The discrepancy in a firm's market and book values usually indicates that certain assets are not recorded in the company, which can be caused by the contribution of intangible assets to the firm value (Bharadwaj et al., 1999). Therefore, Tobin's *q* is the measure of the intangible assets (Wu, 2008). Additionally, the ratio of Tobin's *q* is a forward-looking performance measure because it anticipates a firm's future financial performance, which helps investors to make decisions regarding future investment (Stevens, 1990).

Because the ratio of Tobin's *q* is an intangible and forward-looking organizational performance measure, it has been used for various studies related to the issue of knowledge management. The results of knowledge management are often associated with developing organizational intangible assets and a firm's long-term organizational performance; therefore, Tobin's *q* is frequently used for measuring the financial results of knowledge management-related issues. Bharadwaj et al. (1999) noted that: "Tobin's *q* provides a more appropriate measure of its impact on firm performance" (p. 1019), and find that the investments on information technology were positively associated with a company's future performance potential that can be calculated by Tobin's *q*. Wu (2008) compared organizations that won the Most Admired Knowledge Enterprise (MAKE) Award, with those that did not win, but are of similar sizes in the same industries, and found that the MAKE-awarded companies tended to achieve and sustain higher organizational performance. To compare organizations, he also uses Tobin's *q* as one of the financial measurements, and states that "Tobin's *q* is comparable across industries."

The Balanced Scorecard as a measurement tool for organizational performance.

The Balanced Scorecard has been adopted by many companies as a key performance measurement parameter. It basically emphasizes all aspects of the organizational performance

indicators from intangible to tangible forms of metrics. By combining the financial, customer, internal business process, and innovation/learning perspective, the Balanced Scorecard helps managers to recognize complex interrelationships and causal effects, which can be a base for creating an infrastructure for strategic management (Huang, 2009). The Balanced Scorecard also provides a framework for managing an organization's various change programs by clarifying the strategic objectives and then identifying the few critical drivers (Kaplan & Norton, 1996). The Balanced Scorecard has evolved from a performance measurement to a strategic management tool.

Kaplan and Norton (1996; 2001a; 2001b) submitted that the Balanced Scorecard provides a framework for coming up with measures that define the company's main success indicators and drivers. The process of building and implementing the Balanced Scorecard should be customized to fit a company's mission, strategy, and culture (Kaplan & Norton, 1996). The Balanced Scorecard should not be made into a template that can be applied to a business generally or used on an industry-wide basis because it must be adapted to each unique organizational circumstance for strategic purposes.

Rampersad (2006) suggested that the Balanced Scorecard is just a framework that does not provide much information in terms of specific and customized measures that should be adapted to specific organizations, and indicates that the Balanced Scorecard does not offer customized performance measurement tools for organizations, but instead offers a more general approach designed to incorporate the general aspects of the Balanced Scorecard.

Knowledge Management Capabilities and Organizational Performance

Knowledge management usually benefits an organization by providing employees with the necessary resources to contribute to the organization's knowledge, establishing a strategy for knowledge management, identifying the expected benefits and managing their realization, and making the most of existing technology to store and disseminate information that is most critical to an organization's success (KPMG, 1998). Most respondents to KPMG's survey agreed that knowledge helped their organizations to improve customer focus, employee development, product innovation, and revenue growth and profit (KPMG, 2000). Knowledge management could improve organizational efficiency and productivity by reusing and sharing experience and know-how, as well as the ability to respond more effectively to customers' demands and marketplace changes (Martin, 2003). Knowledge management has been recognized as "an integral part of an organization's strategy to improve business performance" (Carrillo et al., 2003, p. 1).

However, despite all of its benefits, knowledge management is often underestimated because of its weak relationship to organizational performance. The contribution of knowledge management to organizational performance improvement might be insufficient to help managers make strategic decisions, especially when there are other competing initiatives and resource constraints (Carrillo et al., 2003). The main reasons for the weak connection between knowledge management and organizational performance are that the relationships are complex and indirect (Hsu, 2008; Martin, 2003). Generally, knowledge management is implemented in a larger context with other organizational processes and activities, so it is difficult to define its cause-effect relationship. In addition, knowledge management usually involves "soft" benefits, and is

often implemented informally, so it is not easily converted into a measurement of financial performance (Carrillo, 2003; Choi & Lee, 2003).

Nevertheless, many researchers have attempted to make an association between knowledge management and organizational performance, either directly or indirectly. For instance, Choi and Lee (2003) examined the relationship between four different types of knowledge management styles: dynamic, system-oriented, human-oriented, and passive and organizational performance through surveying middle managers in South Korean companies, and found that dynamic knowledge management has the greatest impact on organizational performance, followed by system-oriented, human-oriented, and passive knowledge management styles. However, their measures of organizational performance were totally dependent on organizational members' perceptual responses and were not supported by objective data. Therefore, it would be inaccurate to conclude that perceptual organizational performance led to actual organizational performance. Additionally, Hsu (2008) tried to identify the relationship between human capital and organizational effectiveness by the mediation of the knowledge management process capability. The results indicate that three latent variables are positively related, and human capital was especially positively associated with organizational effectiveness mediated by both knowledge management process capability and structural capital. However, Hsu (2008) assumed that organizational effectiveness would impact organizational performance, but no empirical tests were implemented.

Wu (2008) attempted to link the impact of knowledge management to organizational performance by using different financial measurement tools, such as Return On Assets (ROA), Return On Sales (ROS), Operating Incomes to Assets (OI/A), Operating Income to Sales (OI/S), Operating Income to Employees (OI/E), as well as Tobin's q. Wu (2008) compared 36

organizations that were named *Most Admired Knowledge Enterprise* from 1998 to 2006 with control firms that had similar companies matching Standard Industrial Classification (SIC) codes. Wu (2008) found that the 36 honored companies had superior profitability and firm market value. However, this study did not identify the types of knowledge management used. Indeed, most research studies fail to address how knowledge management is actually used in contemporary organizations and how these processes relate to organizational performance in financial as well as nonfinancial terms.

Importance of Middle Managers in Knowledge Management Processes

In many research studies of knowledge management, the importance of middle managers has been overlooked, and much of the focus has been on top management. The main reason for selecting top managers as the key respondents is that they are able to see the overall organizational structure and are more strategically oriented (Gold, 2001; Smith, 2006a). Often, middle managers are depicted as status quo, saboteurs, or barriers to change, and they are the first targets to be cut off when the company went through restructuring or reengineering processes. Firing middle managers has been regarded as an easy tactic to reduce costs and simplify the system (Embertson, 2006). The importance of the middle manager in strategic formulation and implementation as well as operations has been mostly overlooked.

However, if senior managers dismiss the roles of middle managers, they might miss chances to make radical changes (Huy, 2001). Middle managers usually play key roles in abandoning the old and generating the new (Nonaka, 1988). It is critically important that organizations realize they can improve their performance dramatically by building capabilities of the middle management creatively, aggressively, and systematically (Byrnes, 2005). Although

most strategic decisions are made by the top management, middle managers are the key players who carry out those strategic initiatives, and organizations are highly dependent on the middle managers' flexibilities and leadership skills to adapt them to the company's changing circumstances (Byrnes, 2005; Huy, 2001). Thus, if middle managers are unwilling or unable to carry out those strategic decisions, the implementation of those decisions may be slowed or brought to a standstill. Ultimately, the companies would lose huge market share to competitors and have a difficult time recovering. For example, Huy (2001) noted that 80% of the projects that senior executives had proposed failed or fell short of expectations in a large telecommunication company; meanwhile, 80% of the projects that middle managers proposed succeeded, yielding at least $300 million in annual profits.

Middle managers play a critical role in implementing knowledge management processes for several reasons. First, the base of the middle management is more fertile for creative and value-adding entrepreneurial ideas about how to grow and change a business than are top managers' ideas. Middle management is a more diverse group in functional areas, work experience, geography, gender, and ethnic backgrounds, which could mean that their insights are more diverse (Huy, 2001). Diverse, creative, and innovative ideas must be shared through the knowledge management processes to improve organizational effectiveness, build business competencies, solve complex organizational problems, and satisfy customers (Buckman, 2004; Chong et al., 2000; Sanchez, 2005). Additionally, since those ideas typically exist in middle managers' minds, they should be articulated into explicit knowledge, which can be stored in the knowledge management system.

Second, middle managers usually have broader social networks. They are in the center of social networks within an organization, and they can motivate communication and create the

environment to encourage sharing knowledge (Embertson, 2006). Their social networks are usually informal and can include “unwritten obligations and favors traded” (Huy, 2001, p. 76). Often, as middle managers have built broad and deep social relationships through various job rotations within the organization, they know who really knows what and how to get things done (Huy, 2001).

Third, middle managers are the best at implementing organizational projects, capabilities, and communication. They typically transfer and refine the needs of top management into day-to-day operations, as well as drag up information from lower levels to refer on to management for decision making (Nonaka, 1988). The middle managers better understand entrepreneurial ideas and concepts than those at lower levels, and they have better connections with upper management. Moreover, they are close to day-to-day operations, customers, and frontline employees, so their ideas are highly related to what and where the problems are and can propose appropriate solutions (Huy, 2001). Therefore, it is critically important to build the capabilities of middle managers creatively, aggressively, and systematically for maximizing organizational performance (Byrnes, 2005).

Because middle managers often have more diverse backgrounds and ideas and broader social networks, their creative ideas can be invaluable resources for innovation and further development (Byrnes, 2005; Embertson, 2006; Huy, 2001). Furthermore, they interact continuously with top management and employees, thereby intervening between the visionary but abstract concepts and the rock bottom but practical experiences (Nonaka, 1988). Well-functioning middle managers proactively seek new solutions to remedy problems and promote opportunities for further development.

Summary

Chapter 2 discussed the deeper understanding of literature in knowledge, knowledge management, knowledge management capabilities and organizational performance in the perspectives of the Balanced Scorecard. Moreover, the literature review provided the theoretical basis of the research model being studied.

The first part of this chapter attempted to define knowledge and knowledge management in multiple perspectives. Knowledge can take two forms: tacit and explicit. Tacit knowledge usually resides within individuals, and is difficult to identify because it is often described as what people know but cannot explain (Nonaka, 1996). Explicit knowledge is that which is already articulated in formal language, and easily shared among individuals (Frappaolo, 2006). Basically, the main purpose of knowledge management would be how to manage both tacit and explicit knowledge to improve efficiency and effectiveness of the organization.

For the theoretical foundation, the framework of knowledge management capabilities by Gold, Malhotra, and Segar (2001) was identified. Knowledge management capabilities were discussed within the context of infrastructure and process capabilities. The original framework of knowledge management capabilities includes technology, structure, and culture as knowledge infrastructure capability, and acquisition, conversion, application, and protection as knowledge process capabilities. However, although incentives are powerful motivators for knowledge management activities, the original framework of knowledge management capabilities has failed to notice it. Therefore, the aspect of incentives will be included to the original framework in this dissertation.

For measuring organizational performance, indicators of both financial and nonfinancial aspects must be considered. The financial aspects of organizational performance, such as net

earnings and returns on investment are related to pursuing short-term fixes over long-term strategic goals, whereas the non-financial aspects are related to product quality, work processes, and customer satisfaction. One of the premiere performance measurement tools is the Balanced Scorecard invented by Kaplan and Norton (1992). It measures organizational performance through four different perspectives: financial, customer related, internal business, and learning & growth.

Chapter 3

Method

Introduction

The main objective of the current study is to examine the relationship between knowledge management capabilities and organizational performance, including both financial and nonfinancial aspects. The framework of knowledge management capabilities (Gold, Malhotra, & Segar, 2001) and the key concepts of the Balanced Scorecard (Kaplan & Norton, 1992) were used to measure knowledge management capabilities and organizational performance. This chapter describes the research design that will be used to support or reject the research questions and hypotheses, and the instrumentation used. A discussion is included regarding the reason for using the correlational research design. This chapter offers a discussion of the sample population, the sample plan, data collection, and data analysis, and concludes with a summary highlighting the key points.

Research Questions and Hypotheses

The following questions guided this study:

1. What is the impact of knowledge management capabilities on organizational performance in the South Korean business environment?

    1-a. What kinds of structural relationships between knowledge management capabilities and the four perceptual aspects of organizational performance exist in the South Korean business environment?
    1-b. How do the eight variables of knowledge management capabilities relate to the four perceptual variables of organizational performance in the South Korean business environment?
    1-c. How do the eight variables of knowledge management capabilities relate to the objective financial organizational performance in the South Korean business environment?

2. What are the internal relationships among the eight different knowledge management capabilities aspects?

3. Do differences in practicing knowledge management exist between the upper 100 companies in the KOSPI 200 and the lower 100 companies in the KOSPI 200 organizations?

4. Do differences exist between manufacturing and non-manufacturing organizations in the KOSPI 200?

The first primary research question was the main inquiry of the study to determine whether an organization's investments in knowledge management pay off through organizational performance. There are three related secondary research questions.

The first secondary research question (1-a) was to examine the structural relationships between the latent constructs of knowledge management capabilities, namely, knowledge infrastructure capability and knowledge process capability, and perceptual organizational performance (Figure 3). The null hypotheses are:

H_O1-a-1: There is no significant relationship between knowledge infrastructure capability and perceptual organizational performance.

H_O1-a-2: There is no significant relationship between knowledge process capability and perceptual organizational performance.

The next secondary question (1-b) was to examine the relationships between eight variables of knowledge management capabilities: technology, structure, culture, incentive, acquisition, conversion, application, and protection; as well as the four perceptual variables of organizational performance: customer-related, internal business process, learning & growth, and the financial aspect. The hypothesis for this question was:

H_O2-b: There are no significant relationships among the eight variables of knowledge management capabilities and the four variables of organizational performance.

The sub-hypotheses were used to assess each of the possible relationships between the eight variables of knowledge management capabilities and the four variables of organizational performance. It was hypothesized that there was a significant relationship between each of the variables. For the analyses, the knowledge management capabilities were the independent variables, while the four variables of organizational performance were the dependent variables. Table 2 shows the possible 32 combinations between the independent and dependent variables.

Table 2

Hypotheses of possible combinations between eight KMC independent variables and four organizational performance dependent variables

Hypothesis no.	Hypothesis
H_O1-b-1	There is no significant relationship between technology and customer-related organizational performance.
H_O1-b-2	There is no significant relationship between technology and internal business process organizational performance.
H_O1-b-3	There is no significant relationship between technology and learning & growth organizational performance.
H_O1b-4	There is no significant relationship between technology and perceptual financial organizational performance.
H_O1-b-5	There is no significant relationship between structure and customer-related organizational performance.
H_O1-b-6	There is no significant relationship between structure and internal business process organizational performance.
H_O1-b-7	There is no significant relationship between structure and learning & growth organizational performance.
H_O1-b-8	There is no significant relationship between structure and perceptual financial organizational performance.

(continued)

Table 2 (continued)

Hypothesis no.	Hypothesis
H_O1-b-9	There is no significant relationship between culture and customer-related organizational performance.
H_O1-b-10	There is no significant relationship between culture and internal business process organizational performance.
H_O1-b-11	There is no significant relationship between culture and learning & growth organizational performance.
H_O1-b-12	There is no significant relationship between culture and perceptual financial organizational performance.
H_O1-b-13	There is no significant relationship between incentive and customer-related organizational performance.
H_O1-b-14	There is no significant relationship between incentive and internal business process organizational performance.
H_O1-b-15	There is no significant relationship between incentive and learning & growth organizational performance.
H_O1-b-16	There is no significant relationship between incentive and perceptual financial organizational performance.
H_O1-b-17	There is no significant relationship between acquisition and customer-related organizational performance.
H_O1-b-18	There is no significant relationship between acquisition and internal business process organizational performance.
H_O1-b-19	There is no significant relationship between acquisition and learning & growth organizational performance.
H_O1-b-20	There is no significant relationship between acquisition and perceptual financial organizational performance.
H_O1-b-21	There is no significant relationship between conversion and customer-related organizational performance.
H_O1-b-22	There is no significant relationship between conversion and internal business process organizational performance.

(continued)

Table 2 (continued)

Hypothesis no.	Hypothesis
H_O1-b-23	There is no significant relationship between conversion and learning & growth organizational performance.
H_O1-b-24	There is no significant relationship between conversion and perceptual financial organizational performance.
H_O1-b-25	There is no significant relationship between application and customer-related organizational performance.
H_O1-b-26	There is no significant relationship between application and internal business process organizational performance.
H_O1-b-27	There is no significant relationship between application and learning & growth organizational performance.
H_O1-b-28	There is no significant relationship between application and perceptual financial organizational performance.
H_O1-b-29	There is no significant relationship between protection and customer-related organizational performance.
H_O1-b-30	There is no significant relationship between protection and internal business process organizational performance.
H_O1-b-31	There is no significant relationship between protection and learning & growth organizational performance.
H_O1-b-32	There is no significant relationship between protection and perceptual financial organizational performance.

The third secondary research question (1-c) was to examine the relationships among the eight variables of knowledge management capabilities. The hypothesis for this question was:

H_O1-c**:** There are no significant relationships among the eight variables of knowledge management capabilities and the objective financial organizational performance.

The sub-hypotheses were used to assess each of the possible relationships between the eight variables of knowledge management capabilities and the objective financial organizational

performance. It was hypothesized that there would be a significant relationship between the eight variables of knowledge management capabilities and the objective financial organizational performance. For the analyses, the knowledge management capabilities were the independent variables; the dependent variable was the objective financial organizational performance. Table 3 shows the hypotheses of possible combinations between them.

Table 3

Hypotheses of possible combinations between eight KMC independent variables and the Objective Financial Organizational Performance

Hypothesis no.	Hypothesis
H_O1-c-1	There is no significant relationship between technology and the objective financial organizational performance.
H_O1-c-2	There is no significant relationship between structure and the objective financial organizational performance.
H_O1-c-3	There is no significant relationship between culture and the objective financial organizational performance.
H_O1-c-4	There is no significant relationship between incentive and the objective financial organizational performance.
H_O1-c-5	There is no significant relationship between acquisition and the objective financial organizational performance.
H_O1-c-6	There is no significant relationship between conversion and the objective financial organizational performance.
H_O1-c-7	There is no significant relationship between application and the objective financial organizational performance.
H_O1-c-8	There is no significant relationship between protection and the objective financial organizational performance.

The second primary research question referred to investigating the relationships among the eight different knowledge management capabilities variables: technology, structure, culture, incentive, acquisition, conversion, application, and protection. The hypothesis for the second research question is:

H_O2: There are no significant internal relationships among the eight knowledge management capabilities variables.

The third primary research question examined the difference in knowledge management practices between the upper 100 companies on the KOSPI 200 list and the lower 100 companies on the KOSPI 200 list of organizations. The hypothesis for the third research question was:

H_O3: There is no difference in knowledge management capabilities between the upper 100 companies and the lower 100 companies on the KOSPI 200 list of organizations.

The fourth research question was to examine the differences between the manufacturing and the non-manufacturing organizations within the KOSPI 200. The hypothesis for the fourth primary research question was:

H_O4: There is no difference in knowledge management capabilities between manufacturing and nonmanufacturing companies on the KOSPI 200 list of organizations.

Sample

Korea composite stock price index 200 (KOSPI 200).

The unit of analysis was organizations included on the KOSPI 200 list of organizations in South Korea. The organizations were blue-chip organizations of Korean industry, selected from a list of the Korea Composite Stock Price Index 200 (KOSPI 200). The KOSPI 200 Index was first introduced on June 15, 1994, and currently comprises 93% of the total market value of the

Korean Stock Exchange. The index consists of 200 large companies of the Korean Stock Market Division. The KOSPI 200 organizations were selected for this study because companies of size have the greatest need to implement knowledge management initiatives, have possibly the greatest capability and resources to do so, and potentially reap the greatest benefits (KPMG, 1998). The list of KOSPI organizations is updated every 10 seconds due to capital increase, stock dividend, merger, etc. Therefore, for purposes of this study, it was necessary to set a specific point in time to select the KOSPI 200 organizations. The list of KOSPI 200 organizations was downloaded from KRX.co.kr on the last day of South Korea stock exchanging, December 30, 2009.

Participants.

A study by Gold, Malhotra, and Segars (2001) involved senior executives in the organization who could describe the structural elements in addition to the knowledge-oriented processes. The roles of senior managers differ in South Korean businesses as compared to the Western business environment. Senior managers in South Korea are often involved in deciding the future direction of the company, auditing CEOs' decisions, and deciding profit allocations (Kim, 2003). Moreover, they are often sensitive to revealing their roles and performance in organizational success (Choi & Lee, 2003; Kim, 2003).

On the other hand, middle managers are more actively involved in working processes and knowledge-oriented activities in the South Korean business environment. Nonaka (1988) pointed out that middle management was charged with integrating the viewpoints from both top and lower-level management. Huy (2001) also noted that middle managers contribute significantly to their organizations in their roles as communicators, entrepreneurs, stabilizers, and therapists. Middle managers usually absorb information from the bottom of the organization and report it to

top management, as well as hand down the strategic and visionary decisions to the bottom. They play a central role in resolving contradictions between the visionary but abstract concepts of top management and the experience-grounded concepts from bottom-line personnel (Nonaka, 1988). Moreover, Gold et al. (2001) mentioned that "the use of key informants for knowledge management purposes can come from those in the organization that have access to, and use of, the organization's knowledge" (p.197). Anyone in the organization can be an informant of knowledge management. Therefore, South Korean middle managers were selected as the main participants in the study.

To make the current study more meaningful, respondents selected for this study satisfied two conditions. first, respondents should be working as middle managers. In the South Korean business environment, middle managers typically represent three levels: 'Bu-jang (부장)', 'Cha-jang (차장)' and 'Gwa-jang (과장)'. Recently, however, many South Korean organizations have concluded that fixed job titles could represent leftovers of the traditional bureaucratic system, which could have a negative influence on its culture and employees' motivation and performance. Therefore, they tend to change job titles, for example, 'Team-jang (팀장)', 'GM 1', 'Personal Account Consultant', 'Financial Expert', etc. (Cho, 2002). The possibility exists that some KOSPI 200 organizations might change their job titles, but most middle managers sustain job responsibilities similar to those they had before they changed titles. For this study, respondents at these levels or those who have similar responsibilities were selected within the KOSPI 200 organizations.

The second condition was that the middle managers should have worked in the same organization for at least 6 months because the research attempted to control those who had transferred recently to their current jobs and were not familiar with the new organization.

According to Watkins (2003), when new managers join an organization, it usually takes 6.2 months to adapt to the new environment and begin to contribute to the organization. In South Korean businesses, the Ministry of Unification (2009) reported that 46.9% of employees (n=983) who transferred into their jobs replied that they needed 1 to 3 months to adapt to new working processes. By the end of 6 months, 91.5% of the employees reported positive adaptation to their new working processes. Moreover, 86.8% of the total respondents had become accustomed to the new organizational culture. In this context, normal middle managers might require at least 6 months of working experience in the same organization to be an informed respondent.

Sampling plan.

Primarily, this study had two sampling plans for the organizational level and the individual level. For the organizational level, all organizations listed on the KOSPI 200 were selected for this study. The list of KOSPI 200 organizations was not fixed, rather it was chosen by the South Korean Exchange based on factors such as liquidity and how well the organizations represent their respective markets and industries. The KOSPI 200 for this study was based on December 30, 2009, the last day of stock trading for the year in South Korea.

There are two steps for the sampling plan. This study is designed to collect data from two middle managers at each participating KOSPI 200 organization.The researcher had to figure out which KOSPI 200 organizations allowed their middle managers to participate in the study. If some KOSPI 200 organizations have a policy for not sharing their information to others, it would be problematic to collect data from their employees. To find out which KOSPI 200 organization would participate in the study, the researcher attempted to contact all KOSPI 200 organizations based on contact information obtained primarily from each company's website and phone

directory. Most initial contacts were made by sending emails or calling their representative phone numbers.

The second step was to identify managers to take the survey from the participating organizations. Within the identified KOSPI 200 organizations, which were willing to participate in the study, two or more middle managers were identified to participate in the survey. A convenience sampling procedure, a form of nonprobability sampling in which participants self-select (Urdan, 2005), was used to collect information from middle managers at the participating organizations. The invitation email including the URL to take the survey was distributed to each middle manager within the 200 KOSPI organizations. This procedure increased the sample size of the study, as it was distributed to a larger number of potential participants (Cozby, 2007). A random sampling plan was not used because there was no guarantee that each individual randomly selected for the study would complete the survey. Completion of the survey instruments was voluntary. Therefore, convenience sampling was deemed the most appropriate plan for the current study.

To obtain a sample of middle managers at the KOSPI 200 organizations, contact information was also obtained from each company's website, phone directory, and walk-in visits. Once the contact information was collected, the researcher sent invitation emails to middle managers. Based on the interest of the participants, they voluntarily completed, saved, and stored the survey online. In terms of the convenience sampling plan, a potential limitation exists, that is, the sample of middle managers may not represent the entire population of middle managers in South Korea. Thus, generalizations regarding the target population may be limited to those individuals who voluntarily completed the survey instrument, rather than the entire population.

Sample size.

The sample size estimation was discussed with respect to the required sample size in order to conduct a Structural Equation Modeling (SEM) analysis. In general, the sample size required to draw valid inferences from analyses has been discussed extensively with varying numbers being posited as guidelines. Bryant and Yarnold (1995) suggested that the ratio of the subjects-to-variables should be no less than 5:1, meaning that if the intention is to measure three variables, there would have be at least 15 participants. However, others suggest a minimum sample size of 100 to 200 observations for the SEM analysis and state that smaller sample sizes may have an effect by biasing the SEM analysis (Gorsuch, 1983; Guadagnoli &Velicer, 1988; Hatcher, 1994). For this reason, at least 100 organizations were required for the SEM analysis in order to yield more precise estimates for the analysis. Based on the above information, the minimum sample size required for the current study would be 100 organizations from the KOSPI 200 list. Since the main purpose of the study is to identify the organizational-level relationships between knowledge management capabilities and organizational performance, individual responses from middle managers of KOSPI 200 organizations were averaged based on participants' organizations into the organizational level data. The minimum sample size required for the current study was 100 organizational level responses. For an organization to be eligible to be included as organizational level data, at least two middle managers had to complete the survey. Therefore, the current study required at least 200 individual participants.

Data Collection

Data for this study were collected through two different sources: online survey instruments and archival documents from the most authorized economic publisher in South

Korea were consulted. The data of knowledge management capabilities were collected from middle managers of KOSPI 200 organizations via an online survey. The survey was distributed online by posting the survey in the provided website, ‘Surveymonkey’ (http://www.surveymonkey.com).

The invitation emails were sent to contactable middle managers of the KOSPI 200 organizations. The invitation email included a brief description of the study, the researcher's contact information, as well as the survey URL. The consent letter was not included at the invitation email, instead, the initial page of the online survey was the consent letter.

The survey was designed to be anonymous, except for a demographic questionnaire, which included information regarding the participant’s organization name, age, gender, position within the organization, and number of years in the organization. The survey included voluntary questions regarding the participant’s name, address, post code, telephone number, and email address. The reason for requesting personal information was to prevent the researcher from sending overlapping emails, and to send a small gift to participants. Moreover, this item could assurance that the survey was completed by the actual invited person and not by a deputy.

The current study examined organizational performance as the unit of analysis, rather than individual performance. Individual responses were collected from each KOSPI 200 organization and averaged to compute organizational performance. Each organization became one respondent for this study, and responses were solicited from at least two middle managers.

The raw data from the online survey instrument were downloaded and saved in a password-protected computer file. The responses to each of the questions on the survey instrument were imported into a Microsoft Excel® spreadsheet. If any data were printed, the paper copies were stored in a locked filing cabinet to which the researcher alone had access.

Thus, the confidentiality of each participant was maintained. All data will be kept on file for a period of 5 years and then destroyed from the hard drive. All paper-based information will be shredded.

Instrument

The instrument used to gather data consisted of three parts: general information, knowledge management capabilities, and organizational performance. The knowledge management capabilities survey employed a Likert scale ranging from 1-6, from (1) strongly disagree, (2) disagree, (3) somewhat disagree, (4) somewhat agree, (5) agree, and (6) strongly agree. The Likert scale was developed by Likert in 1932 to present a set of attitude statements, and is a unidimensional scaling method, measuring either positive or negative responses to a statement (Trochim, 2005). Originally, the Likert scale consisted of 5 levels of agreement or disagreement with a list of statements. In addition to the original 5-point scale, it can be extended to include 4-, 6-, and 7-point scales (Touliatos et al., 2001). For this proposed study, a 6-point scale was selected. The 6-point Likert type scale is similar to the 7-point model except that the third level of agreement, "neither agree nor disagree," was excluded from the survey. The third level was not included as an option on the survey, so that the responses presented the respondents' opinions as negative or positive.

Back translation procedure.

The units of analysis were organizations located within South Korea, and the targeted participants were South Korean middle managers. However, the instruments of general information, knowledge management capabilities, and organizational performance were written in English. Therefore, it was necessary to translate the instrument into Korean.

However, translating into another language might create translating nuances in meaning which could affect the reliability and validity of the research. Translation nuances often occur during the translation process due to different meanings of vocabularies, expressions, phrases, and cultural differences. When a researcher adopts an instrument written in another language, an appropriate translation procedure is required to secure psychological equivalency between the original and another language. One of the most popular procedures for reducing the translation nuances is the back translation procedure, which is "the process of translating the translated target language version back to the source language by a bilingual person" (Kim & Lim, 1999, p.6). There are three basic steps in the back translation procedure. First, the original instrument should be translated into another language version by a bilingual person who speaks both languages fluently. Kim and Lim (1999) also stated that the bilingual person should be able to understand both cultures as well. For the current study, the initial translation procedure was done by the researcher, and then, the translated version of the instrument was inspected by two professionals. The first professional was an HR General Manager from a South Korean branch of an American company, who could speak both Korean and English fluently. The other professional was a Korean professor at a major university in South Korea and an editor of the *Korean Journal of Industrial and Organizational Psychology*. He was a former president of the Korean Society for Industrial and Organizational Psychology, and his main interests are the development and assessment of leadership, achievement goal orientations, creativity in organization, and psychological contracts. They investigated the first translated instrument to verify whether words used in the instrument were actually used in South Korean businesses, and whether the instrument delivered the actual meaning of the original instrument. The second procedure was to back translate the translated instrument into the original language. In this

process, the researcher commissioned the Korean version instrument to Mytrans.com, an authorized translation company working for major South Korean private and public organizations, including Samsung Electronics, LG Electronics, the Ministry of Culture, Sports and Tourism, and the Ministry of Public Administration and Security. The last step compared two versions of instruments: the original and the back translated. This process checked for general meaning of the sentences, complexity levels, forms, semantic similarity of words, and grammatical structures. If items did not accord with the original version, those items were retranslated, back translated, and re-compared.

Validation for the instrument.

Prior to collecting data for the proposed study, a pilot study was conducted with clients whose positions were middle managers in a major HR consulting firm in South Korea. The small group of middle managers was not included in the sampling frame and analysis of the actual study. The main purposes of the pilot study were: (1) to verify that the translated survey instrument still measured the variables the instruments were supposed to measure, and (2) to reduce numbers of survey items.

The survey was translated into Korean to confirm that the meanings of each item delivered the actual meanings. This was because the survey was translated into a language that it was not designed for. Thus, in order to make sure that the same definitions and meanings reached the intended target population, a pilot study should be conducted. The questions were well-defined and checked for ambiguities. The information collected during the pilot study provided feedback with respect to how well the instrument measured what it intended to measure. If the meanings of the items were ambiguous, which could occur due to the language differences, the items would be reworded.

Moreover, it was concluded that if the number of survey items were too many (134 items), this would negatively affect the survey return rate. The lower response rate might increase the possibility of non-response error (Vogt, 2005). Dillman et al. (1993) mentioned that an increase in the length of a questionnaire tends to decrease the response rate. Therefore, the pilot study was conducted to make sure whether certain questions could be used to measure a latent variable and reduce the number of survey items for a better response rate.

The main validation strategy for the pilot study was conducting exploratory factor analysis (EFA). An EFA is broadly used as a data reduction and exploratory technique. In it, one determines if certain questions or variables can be used to measure an underlying or latent variable (e.g., technology, structure, culture, incentive, acquisition, conversion, application, protection, financial, customer-related, internal business process, and learning & growth) (De Vaus, 2002). This is often used when the variables for a study are comprised of Likert-type questions on a survey instrument. The factor analysis finds the questions or variables that explain the largest amount of variation in the questions or variables. As a result of this analysis, these questions or variables were combined to provide a single measure for a latent variable.

A minimum of 100 participants was selected for the pilot study. The purpose was to ensure that the translation in the language of the instrument had not affected the interpretability of the results or the variables that would be constructed. For this reason, the EFA was used as an exploratory approach to confirm the unobserved variables measured by the survey instrument that had been previously validated in literature, rather than validate an entirely new instrument. One hundred clients of the major HR consulting firm in South Korea were included in the EFA and reliability pilot study analysis.

The sample size estimation was discussed with respect to the required sample size in order to conduct an EFA. In general, the sample size that would be required to draw valid inferences from an analysis has been discussed extensively, with varying numbers being posited as guidelines. Bryant and Yarnold (1995) suggested that the ratio of the subjects-to-variables should be no less 5:1, meaning that if the intention is to measure three variables, there would have be at least 15 participants. On the other hand, others have suggested a minimum sample size of 100 to 200 observations for this analysis (Gorsuch, 1983; Guadagnoli &Velicer, 1988; Hatcher, 1994). It has been stated that smaller sample sizes may have an effect on the analyses by making the factors determined from the analysis unstable. For this reason, the latter recommendation of 100 participants was used in order to provide more evidence of a latent variable in the dataset because the estimates would not vary as much as they would with smaller sample sizes. Based on the above information, the minimum sample size required for this study would be 100.

General information.

The demographic questionnaire included information about the organization's name, department, age, gender, position, and years of experience for each of the participants. Such information established whether the sample overrepresented a certain group of individuals. G1 and G2 were open-ended items, asking about participants' organizations and departments. According to G1, results of the survey were categorized and aggregated at the organizational level for further analysis. The remaining items were multiple choice questions. Table 4 shows the survey items of general information.

Table 4

Items of General Information

Variable Name	Item
G1	What is the name of your organization?
G2	What is your department in your organization?
G3	What age range do you fall into?
G4	What is your gender?
G5	What is your position in your organization?
G6	How long have you worked for your organization?

Note. 'G' stands for general information.

Knowledge management capabilities.

Knowledge management capabilities consist of knowledge infrastructure and process capabilities. Specifically, Gold (2001) identified that knowledge infrastructural capability includes knowledge management-related infrastructures, such as technology, structure, culture; knowledge process capability includes knowledge management-related processes, such as acquisition, conversion, application, and protection (Figure 1).

The original framework of knowledge management capabilities did not include the concept of incentives. In a typical organization, incentives are powerful motivators to facilitate knowledge management activities (Hansen, Nohria, & Tierney, 1999). Moreover, the standardized incentive system could help institutionalize knowledge sharing behavior so that it becomes the common organizational culture (APQC, 2001). For these reasons, the topic of incentives was included in the original framework of knowledge management capabilities (Figure 2).

Knowledge infrastructure capability.

The knowledge infrastructure capability is comprised of four components: technology, organizational structure, organizational culture, and incentives. Each of these components is defined in the following subsections.

Technology.

Gold et al. (2001) stated that "technology comprises a crucial element of the structural dimension needed to mobilize social capital for the creation of new knowledge" (p.187). Technology enables and supports core activities such as knowledge creation, knowledge sharing, knowledge distribution, and knowledge application. The questions used to measure the technology component of the organizations are presented in Table 5.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

Table 5

Measures of Technology Knowledge Management Infrastructure

Variable Name	Item
My organization …	
TI1	Has clear rules for formatting or categorizing its product knowledge
TI2	Has clear rules for formatting or categorizing process knowledge
My organization uses technology that allows …	
TI3	It to monitor its competition and business partners
TI4	Employees to collaborate with other persons inside the organization
TI5	Employees to collaborate with other persons outside the organization
TI6	People in multiple locations to learn as a group from a single source or at a single point in time
TI7	People in multiple locations to learn as a group from a multiple source or at multiple points in time
TI8	It to search for new knowledge
TI9	It to map the location (i.e. an individual, specific system, or database) of specific types of knowledge
TI10	It to retrieve and use knowledge about its products and processes
TI11	It to retrieve and use knowledge about its markets and competition
TI12	It to generate new opportunities in conjunction with its partners

Note. 'TI' stands for technology infrastructure.

Organizational Structure.

Organizational structure is defined as "rules, policies, procedures, processes, hierarchy of reporting relationships, incentive systems, and departmental boundaries that organize tasks within the firm" (Gold, Malhotra, & Segars, 2001, p.198). Since the organizational structure can affect individual behavior, it should be designed to support effective knowledge flow and activities (Casselman & Samson, 2007; Iftikhar, 2003; Walker, 2006). The original questionnaire of organizational structure consists of 12 items, but item SI6, "has a standardized reward system for sharing knowledge," was moved to the incentive section. The questions used to measure the organizational structure component were presented in Table 6.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

Table 6

Organizational Structure Knowledge Management Infrastructure

Variable Name	Item
My organization ('s)…	
SI1	Structure of departments and divisions inhibits interaction and sharing of knowledge
SI2	Structure promotes collective rather than individualistic behavior
SI3	Structure facilities the discovery of new knowledge
SI4	Structure facilitates the creation of new knowledge
SI5	Bases our performance on knowledge creation
SI6	Designs processes to facilitate knowledge exchange across functional boundaries
SI7	Has a large number of strategic alliances with other firms
SI8	Encourages employees to go where they need for knowledge for errors/mistakes
SI9	Managers frequently examine knowledge for errors/mistakes
SI10	Structure facilitates the transfer of new knowledge across structural boundaries
SI11	Employees are readily accessible

Note. 'SI' stands for structural infrastructure.

Organizational Culture.

Denison (1990) defined organizational culture as the "underlying values, beliefs and principles that serve as a foundation for the organization's management system, as well as the set of management practices and behaviors that both exemplify and reinforce those principles" (p. 2). However, for the current study, organizational culture indicates knowledge sharing culture. If an organization has a strong knowledge sharing culture, it can react quickly to key issues, which leads to having more competitive advantages (Chong et al., 2000). The questions used to measure the organizational culture component are presented in Table 7.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions to be included on the survey instrument.

Table 7

Measures of Cultural Knowledge Management Infrastructure

Variable Name	Item
In my organization…	
CI1	Employees understand the importance of knowledge to corporate success
CI2	High levels of participation are expected in capturing and transferring knowledge
CI3	Employees are encouraged to explore and experiment
CI4	On-the-job training and learning is valued
CI5	Employees are valued for their individual expertise
CI6	Employees are encouraged to ask others for assistance when needed
CI7	Employees are encouraged to interact with other groups
CI8	Employees are encouraged to discuss their work with people in other workgroups
CI9	Overall organizational vision is clearly stated
CI10	Overall organizational objectives are clearly stated
CI11	Knowledge is shared with other organizations (e.g., partners, trade groups)
CI12	The benefits of sharing knowledge outweigh the costs
CI13	Senior management clearly supports the role of knowledge in our firm's success

Note. 'CI' stands for cultural infrastructure.

Incentive.

Converting knowledge into a shareable format requires cost, effort, and time, so potential knowledge providers are often unwilling to share their knowledge, unless they are rewarded for it directly (Evaristo, 2005; Suresh, 2002). Sharing organizational knowledge significantly increases if the appropriate incentive system motivates and encourages employees to do so (Davenport & Prusak, 1998; Gammelgaard, 2007; Stajkovic & Luthans, 2001; Wolfe & Loraas,

2008). In general, there are two types of incentives: monetary and nonmonetary. II1, II2, II3, II4, and II5 were related to monetary incentives, while the others were about nonmonetary incentives.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

Table 8

Items Measures of Incentive Knowledge Management Infrastructure

Variable Name	Item
My organization…	
II1	Rewards employees financially for submitting their ideas to the firm
II2	Offers monetary incentives or other financial rewards for sharing knowledge with the firm or other coworkers
II3	Offers monetary incentives or other financial rewards for sharing knowledge within groups and teams
II4	Offers monetary incentives or other financial rewards for sharing knowledge between groups and teams
II5	Offers monetary incentives or other financial rewards (e.g., raises or bonuses) for contributions made to a knowledge repository or electronic database
In my organization,	
II6	Sharing knowledge will enhance my reputation within this organization
II7	Sharing knowledge will be beneficial for my career
II8	My supervisor or coworkers praise me because I share knowledge with them
II9	Good knowledge management behavior is monitored and built into the appraisal system
II10	Negative knowledge management behavior (e.g., hoarding, not using best practices, etc.) is actively discouraged
II11	Individuals are visibly rewarded for teamwork, knowledge sharing, and reuse of knowledge

Note. 'II' stands for incentive infrastructure.

The original framework of knowledge management capabilities did not include the perspective of incentives, even though it is significant in encouraging knowledge sharing. The

questionnaire for measuring incentives was adopted from Cockrell's study (2008). Originally, there were seven items for measuring monetary incentives, but only five items (II1, II2, II3, II4 and II5) were selected. The reason for not including the other two items was that the items shared the same meaning except they were reverse scales of one another. For example, in Cockrell's study (2008) the sixth item, "it makes no difference to me, financially, if I share my knowledge with others" and the seventh item, "sharing knowledge with others does not provide any financial rewards at the company or firm" were not adopted for this study (p. 61).

However, these items were only asking about monetary incentives. Since both monetary and nonmonetary incentives can motivate knowledge sharing, nonmonetary items were created. The questions used to measure the incentive component of the organizations are presented in Table 8.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

Knowledge process capability.

The knowledge process capability is comprised of four components: acquisition, conversion, application, and protection. Each of the aforementioned components is defined in the following subsections.

Acquisition.

Gold (2001) described the processes of acquiring knowledge in diverse terms such as seeking, generating, creating, capturing, and collaborating, but the main purpose of the process is to acquire knowledge. Milton (2007) defined knowledge acquisition as "the activity of capturing expertise from people (and other sources of knowledge) and creating a computerized store of this

knowledge to be used to help an organization in some specified ways" (p. 1). The questions used to measure the acquisition component of the organizations are presented in Table 9.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

Table 9

Measures of Knowledge Management Acquisition Process

Variable Name	Item
My Organization…	
AQP1	Has processes for acquiring knowledge about our customers
AQP2	Has processes for generating new knowledge from existing knowledge
AQP3	Has processes for acquiring knowledge about our suppliers
AQP4	Uses feedback from projects to improve subsequent projects
AQP5	Has processes for distributing knowledge throughout the organization
AQP6	Has processes for exchanging knowledge with our business partners
AQP7	Has processes for interorganizational collaboration
AQP8	Has processes for acquiring knowledge about new products/services within our industry
AQP9	Has processes for acquiring knowledge about competitors within our industry
AQP10	Has processes for benchmarking performance
AQP11	Has teams devoted to identifying best practices
AQP12	Has processes for exchanging knowledge between individuals

Note. 'AP' stands for acquisition process.

Conversion.

Gold et al. (2001) described the knowledge conversion process as making existing knowledge useful. Knowledge management should support the conversion process for making knowledge shareable (Bhatt, 2001; Büchel & Probst, 2000; Sanchez, 2005). The questions used to measure the conversion component of the organizations are presented in Table 10.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

Table 10

Measures of Knowledge Management Conversion Process

Variable Name	Item
My organization has processes for …	
CP1	Converting knowledge into the design of new products/services
CP2	Converting competitive intelligence into plans of action
CP3	Filtering knowledge
CP4	Transferring organizational knowledge to individuals
CP5	Absorbing knowledge from individuals into the organization
CP6	Absorbing knowledge from business partners into the organization
CP7	Distributing knowledge throughout the organization
CP8	Integrating different sources and types of knowledge
CP9	Organizing knowledge
CP10	Replacing outdated knowledge

Note. 'CP' stands for conversion process.

Application.

Knowledge application entails making knowledge more active and relevant to create more values (Bhatt, 2001). Knowledge becomes useful to an organization only when it is applied in action within an organization's processes; otherwise, it is wasted (Sanchez, 2005). Knowledge management must ensure that knowledge is actually used and exploited in effective ways to create value. Sanchez (2005) stated, "the basic goals of knowledge management practice are not just generating new knowledge, but also assuring that new and existing knowledge is actually applied in all processes where the knowledge can be used throughout an organization" (p. 12). The questions used to measure the application component of the organizations are presented in

Table 11.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

Table 11

Measures of Knowledge Management Application Process

Variable Name	Item
My organization…	
APP1	Has processes for applying knowledge learned from mistakes
APP2	Has processes for applying knowledge learned from experiences
APP3	Has processes for using knowledge in development new products/services
APP4	Has processes for using knowledge to solve new problems
APP5	Matches sources of knowledge to problems and challenges
APP6	Uses knowledge to improve efficiency
APP7	Uses knowledge to adjust strategic direction
APP8	Is able to locate and apply knowledge to changing competitive conditions
APP9	Makes knowledge accessible to those who need it
APP10	Takes advantage of new knowledge
APP11	Quickly applies knowledge to critical competitive needs
APP12	Quickly links sources of knowledge in solving problems

Note. 'APP' stands for application process.

Protection.

Knowledge resources are the source of competitive advantages, and must be secured from competitors. Knowledge protection involves security-oriented management processes, "designed to protect the knowledge within an organization from illegal or inappropriate use or theft" (Gold, Malhotra & Segars, 2001, p. 192). The questions used to measure the protection component of the organizations are presented in Table 12.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

Table 12

Measures of Knowledge Management Protection Process

Variable Name	Item
My organization…	
PP1	Has processes to protect knowledge from inappropriate use inside the organization
PP2	Has processes to protect knowledge from inappropriate use outside the organization
PP3	Has processes to protect knowledge from theft from within the organization
PP4	Has processes to protect knowledge from theft from outside the organization
PP5	Has incentives that encourage the protection of knowledge
PP6	Has technology that restricts access to some sources of knowledge
PP7	Has extensive policies and procedures for protecting trade secrets
PP8	Values and protects knowledge embedded in individuals
PP9	Clearly identifies restricted knowledge
PP10	Clearly communicates the importance of protecting knowledge

Note. 'PP' stands for protection process.

Organizational performance.

The original instrument included questionnaires about knowledge infrastructure capability, knowledge process capability, and organizational effectiveness. However, in the current study, the items of organizational effectiveness were excluded, and the four aspects of the Balanced Scorecard were used. Gold et al. (2001) indicated organizational effectiveness as activities which may include: (1) “improved ability to innovate, improved coordination of efforts, and rapid commercialization of new products;” and (2) “the ability to anticipate surprises, responsiveness to market change, and reduced redundancy of information /knowledge” (p.196). Further, Malhotra and Segars (2001) asserted that organizational effectiveness is deeply related

to three important processes of efficiency, adaptability, and innovativeness, and that it could represent key aspects of organizational performance shown in the Balanced Scorecard. Furthermore, the Balanced Scorecard instrument includes the financial aspects of organizational performance. The concept of the Balanced Scorecard could cover the three major processes of organizational effectiveness, and could measure organizational performance in greater detail. For this reason, this study adopted the concept of the Balanced Scorecard instead of organizational effectiveness. By combining the financial, customer, internal business processes, and learning & growth perspectives, the Balanced Scorecard helps managers recognize complex interrelationships and causal effects, which can be a base for creating an infrastructure for strategic management (Huang, 2009). Kaplan and Norton (1996; 2001a; 2001b) noted that the Balanced Scorecard provides a framework for coming up with measures that define the company's main success indicators and drivers.

The organizational performance survey was adopted from Blackmon's (2008) instrument, which made the concept of the Balanced Scorecard into the perceptual survey. This provided quantitative information regarding the measures that defined a company's main success indicators and drivers. There are four perspectives of organizational performance: financial, customer-related, internal business, and learning & growth, and they were converted into organizational members' perceptual survey. The financial perspective of organizational performance was obtained from two sources: the perceptual survey and the archival data source. To measure the objective data of financial organizational performance, Tobin's q was calculated by taking the ratio of the firm's assets to the costs of replacement of those assets (Tobin, 1969). A firm's assets are measured by the market value of its stock and outstanding debt. A Tobin's q ratio greater than 1 indicates that the firm is earning a rate of return higher than the costs of its

assets (Tobin, 1969). This procedure provided both objective information as well as subjective perspectives of organizational performance.

The customer-related aspect of organizational performance.

A company must invest resources into building a strong relationship with its customers. Such a relationship generally yields long-term success for a company. The major purposes of the customer-related perspective are about how the firm is viewed by and serves its customers, which results in increased organizational financial performance (Huang, 2009; Kaplan & Norton, 1996). The questions used to measure the customer-related perspective of the organization performance are presented in Table 13.

Table 13

Measures of the Customer-Related Aspect of Organizational Performance

Variable Name	Item
In my organization …	
CR1	The quality of services/products that we provide has improved
CR2	The number of services/products that we provide has improved
CR3	The type of services/products that we provide has improved
CR4	The number of people who are using our services/products has increased
CR5	The demand for the services/products that we provide has increased
CR6	The average price of our services/products is lower than our key competitors
CR7	Our services/products are considered leaders in the market
CR8	Customers are leaving due to poor services/products
My organization …	
CR9	Consistently meets the expectations of our customers
CR10	Takes actions to learn what services/products customers need
CR11	Has established a fine reputation due to our services/products
CR12	Introduces innovative and unique functional services/products more often than our competitors

Note. 'CR' stands for customer related aspect of organizational performance.

Items related to the customer service aspect were based on Niven (2006), and were adopted and created based on the three value propositions: operational excellence, product leadership, and customer intimacy. Among 12 items, 6: CR1, CR2, CR3, CR5, CR9, and CR10, were directly adopted from Blackmon (2008). However, the target population of Blackmon's study was nonprofit organizations, so some items may be incompatible with the current study, which targets profit-oriented firms. Therefore, seven items were created based on the three value propositions. The items of CR1, CR2, CR3, CR4 and CR6 were related to operational excellence; CR5, CR7 and CR12 were related to product leadership; and CR8, CR9, CR10, and CR11 were related to customer intimacy.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

The internal business aspect of organizational performance.

The internal business aspect is primarily concerned with which business processes are most significant in satisfying customers and stakeholders. Excellent customer satisfaction is usually induced from internal business processes, decisions, and actions occurring throughout an organization (Kaplan & Norton, 1992). Moreover, financial results could be obtained by successful implementation of strategic initiatives in key business process perspectives (Kanji & Sá, 2002). The questions used to measure the internal business perspective of the organization performance are presented in Table 14.

Table 14

Measures of the Internal Business of Organizational Performance

Variable Name	Item
My organization …	
IB1	Has improved our planning processes
IB2	Has improved our quality control processes
IB3	Has improved our service/product delivery processes
IB4	Has developed policies and procedures to increase customer satisfaction
IB5	Consistently follows services/products quality protocols
IB6	Introduces more new services/products than our competitors
IB7	Has better R&D cycle time for services/products than our competitors (length of time from conception to introduction)
IB8	Receives more customer complaints then our competitors (reverse scale)
IB9	Is spending more dollars on R&D than our competitors
IB10	Constantly attempts to improve our brand recognition
In my organization …	
IB11	Program planning is based upon our mission
IB12	Management makes it easier to achieve our mission

Note. 'IB' stands for internal business process of organizational performance.

The items related to the internal business perspective referred to the four propositions: operations management, customer management, innovation, and regulatory and social measures. Among 12 items, 7: IB1, IB2, IB3, IB4, IB5, IB10, and IB11, were adopted from Blackmon's (2008) study, according to the four propositions. Items IB1, IB2, and IB3 were related to operations management measures; IB4, IB8, and IB10 were related to customer management measures; IB6, IB7, and IB9 were related to innovation measures; and IB5, IB11, and IB12 were related to regulatory and social measures.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

The learning & growth aspect of organizational performance.

The learning & growth perspective has to do with how a firm learns, improves, and innovates to meet its objective, and deals mostly with employee-centered and intangible aspects of organizational performance. The ability to innovate, improve, and learn is directly related to the company's value, and these abilities lead to the launch of new products, create more values for customers, and improve operating efficiencies, which can lead to penetrating new markets and increasing revenues and margins (Kaplan & Norton, 1992). The questions used to measure the learning & growth perspective of the organization performance are presented in Table 15.

Table 15

Measures of the Employee Learning & Growth Aspect of Organizational Performance

Variable Name	Item
In my organization …	
LG1	My job is directly related to our mission
LG2	My job is satisfying
LG3	My job is boring (reverse scale)
LG4	My job gives me a sense of accomplishments
LG5	I lack of core competencies to perform my job (reverse scale)
LG6	In a normal work week I receive enough information to perform my job
LG7	I have enough information to make optimal decisions to accomplish my performance objectives
LG8	I have clear performance objectives
LG9	I am very productive on the job
My organization provides…	
LG10	The training that I need to meet my job requirement
LG11	Training that is linked to organizational goals and objectives
LG12	Necessary equipment/tools to accomplish my performance objectives

Note. 'LG' stands for learning & growth of organizational performance.

The items related to the learning & growth perspective referred to three forms of capital: human, information, and organizational. The 8 items, LG1, LG2, LG3, LG4, LG6, LG7, LG8,

and LG10, were directly adopted from Blackmon's (2008) study; LG5, LG8, LG9, LG10, and LG11 were related to human capital measures; LG6, LG7, and LG12 were related to information capital measures; and LG1, LG2, LG3, and LG4 were related to organizational capital measures.

Based on the results of the pilot test, the number of items was reduced so that the most internally consistent items were used in the analysis, while minimizing the number of questions that would have to be included on the survey instrument.

The financial aspect of organizational performance.

The financial perspective of organizational performance was obtained from two sources: the online survey and the archival data source. The perceptual financial perspective of organizational performance was collected from the online survey, and the objective financial perspective of organizational performance was collected from the archival data source. There is a tacit agreement that one standpoint of financial measure, either a subjective or objective financial indicator, is not enough to evaluate organizational performance, and it would be better to use both indicators as supplements to each other (Torenvlied & Akkerman, 2009).

For measuring the perceptual financial performance, the online survey was used. The survey items were created by the researcher on the basis of Niven's book (2006). The researcher created these items according to the following considerations. First, items should be suitable for both manufacturing and nonmanufacturing organizations. For example, some items such as asking about inventory turnover might not be an appropriate item for nonmanufacturing companies. Also, items similar to other performance indicators (Customer-related, Internal Business Process, and Learning & Growth) were not included in this study, because they might be blurred with other financial indicators. Moreover, many financial measurement items were based on complicated accounting or economic theories, which might not be understood easily by

typical middle managers. Therefore, items were kept as simple as possible. The questions used to measure the perceptual financial perspective of the organization performance are presented in Table 16.

For measuring the objective financial performance of the organizations, a measure of Tobin's *q* was calculated for the given organizations included in the sample. The Tobin's *q* was developed by James Tobin (1969), and refers to the ratio that compares the market value of a company's stocks with the value of its equity book value. If Tobin's *q* is greater than 1.0, it could indicate that the market value reflects unrecorded or unmeasured company assets, which can be intangible assets of the company. On the other hand, if the ratio is less than 1.0, it implies that market value of the assets is less than the recorded value. Since the ratio of Tobin's *q* is an intangible and forward-looking organizational performance measure, it has been used for various research studies related to the issue of knowledge management. Moreover, Luo and Donthu (2006) noted that Tobin's *q* is comparable across industries and employs the method to calculate the *q* value for each firm-year observation. After Tobin's *q* was introduced, multiple methods have been formulated to calculate the ratio of Tobin's *q*. However, this study adopted the basic formula of Tobin's *q*, which was:

Tobin's q = (Equity Market Value + Liabilities Book Value) / (Equity Book Value + Liabilities Book Value)

The two data sources were used for calculating Tobin's *q*. To investigate the market value of a company's stock, the financial data were downloaded from the Korea Exchange (KRX) website (www.krx.co.kr), and the equity book value was obtained from the Mae Kyung SMT. Mae Kyung is abbreviated from the *Maeil Kyung-jae* Newspaper, the most recognized business newspaper in South Korea. Annually, the *Maeil Kyung-jae* Newspaper publishes the book, *Mae*

Kyung SMT, which includes the financial information of 1000 South Korean companies. The information includes each company's basic information, total sale value, total book assets, and so on. The company's equity book value will be derived from the *Mae Kyung SMT* 2010 version, which includes the financial data for the 3 previous years. The company's equity book value from *Mae Kyung SMT* was based on the previous year, 2009, so the market value from KRX is data from December 30, 2009, the last day of stock market operations in 2009.

Table 16

Measures of the Perceptual Financial Aspect of Organizational Performance

Variable Name	Item
PF1	Our organization has improved its asset utilization
PF2	Our net income has increased
PF3	Our sales have increased
PF4	Our market value has increased

Note. 'PF' stands for the perceptual financial aspect of organizational performance.

Items about the perceptual financial aspect of organizational performance were included after the pilot study. Therefore, the number of questions was not minimized and the internal consistency was not verified through the exploratory factor analysis.

Data Analysis

The main research design of this study was a quantitative correlational design to study the relationships among the variables of knowledge management capabilities and organizational performance as measured by the four variables of Norton and Kaplan's (1996; 2001a; 2001b) Balanced Scorecard. In addition, an objective measure of financial performance called Tobin's q was used to study the relationships among the variables of knowledge management capabilities and organizational performance. The quantitative correlational design assesses the relationships

that may exist between and among variables (Cozby, 2007). More specifically, when the variables in the study are continuous (meaning the variables will be measured on an interval/ratio scale), a correlational design would be used to determine the linear relationship between the variables (Burns & Grove, 2005). The purpose of the correlational design is to determine if a relationship exists between the variables and whether the relationship is statistically significant. By using the quantitative correlational research design, the questions of what are the relationships and how much one variable impacts the other were assessed.

The analysis of the data collected for this study was done in SPSS Version 17.0® , AMOS Version 17.0® and SAS 9.1® . For each research question, the data were imported into AMOS through SPSS. The analyses included descriptive and summary statistics, a structural equation modeling (SEM), a multivariate analysis, a simple linear regression, a Pearson's correlation coefficient, and a Student's t-test.

Statistical techniques.

Validation.

Initially, it is important to develop and validate frameworks for knowledge management capabilities and organizational performance in the South Korean business environment. Without any validated instruments related to knowledge management capabilities and organizational performance, it would be impossible to identify the relationship between them. Since knowledge management is an emerging field in the current business environment, there are few validated instruments related to knowledge management capabilities. Moreover, this study adopted the concept of the Balanced Scorecard to measure organizational performance, because it is best measured from multiple perspectives (Kaplan & Norton, 1992). However, there are few validated instruments adopting the concept of the Balanced Scorecard. In this study, Gold's

(2001) framework of knowledge management capabilities and Niven's (2002) instrument for the Balanced Scorecard were modified and adopted, but their validity was unknown in the South Korean business environment. Moreover, inasmuch as incentives encourage knowledge management activities, the value of incentives in knowledge management was added to the original framework. Therefore, this study initially attempted to validate the instruments related to knowledge management capabilities and organizational performance.

To determine the key construct dimensions of organizational capabilities related to knowledge management and organizational performance in the South Korean business environment, a confirmatory factor analysis (CFA) was used, which was a measurement model of structural equation modeling (SEM). The SEM research combines both the confirmatory and exploratory data analysis approach. A CFA was performed to ascertain that the items on the survey instrument measured the hypothetical constructs the survey intended to measure (Gorsuch, 1983). The hypothetical constructs or underlying variables were measured by using several observable variables that are then combined to measure the hypothetical constructs. The hypothetical constructs measured for the current study were the dimensions of organizational capabilities related to knowledge management and the four aspects of organizational performance. The CFA was used to confirm the key dimensions of organizational capabilities related to knowledge management and the four aspects of organizational performance in the South Korean business environment.

Additionally, construct validity, that which accurately measures the constructs of interest was tested (Vogt, 2005). Good construct validity could indicate a flawless theoretical basis which is translated through clear operational definitions involving measureable indicators. To test construct validity, two types of validity tests were implemented: convergent and discriminant.

Both convergent and discriminant validity are considered subcategories of construct validity, and it is recommended that both should be checked together for establishing construct validity (De Vaus, 2002; Trochim, 2005).

Convergent validity could be explained by the correlation among items which make up the scale or instrument measuring a construct. For checking convergent validity, a factor loading (λ) and average variance extracted (AVE) were examined. The significance of individual item loadings (factor loading, λ) through t-value was examined. If the factor loadings are greater than .50, items are significantly loaded on their respective latent factors (Bagozzi & Yi, 1988). Additionally, AVE was examined. In general, if AVE is at least .50, the variance explained by the construct is greater than the measurement error, and convergent validity could be present.

Discriminant validity is primarily obtained when several constructs are dissimilar, so it is possible to discriminate among these constructs (Campbell & Fiske, 1959). To check for discriminant validity, there is no single definitive test, nor is it typically established in a single study (Kline, 2005). The structural equation model of confirmatory factor analysis itself could be a powerful tool for evaluating construct validity. However, in this study, discriminant validity was ascertained by "whether the confidence interval (± two standard errors) of the correlation between the two factors includes 1.0" (Anderson & Gerbing, 1988, p.416). The main purpose of this test is to test the hypothesis that two constructs are identical ($\emptyset = 1.0$). If the score of $\emptyset \pm 2 \times$ standard error is less than 1.0 within 95% of confidence interval, it would be acceptable to indicate that discriminant validity exists.

The first research question.

The first research question involved the major purpose of this study: to identify the relationship between knowledge management capabilities and organizational performance. There were three secondary research questions.

1. What is the impact of knowledge management capabilities on organizational performance in the South Korean business environment?

    1-a. What kinds of structural relationships between knowledge management capabilities and the four perceptual aspects of organizational performance exist in the South Korean business environment?

The first secondary research question (1-a) was mostly related to the main purpose of this study: to identify the overall relationship between knowledge management capabilities and organizational performance. In this study, knowledge management capabilities are categorized into two capabilities: knowledge infrastructure capability, which includes four variables (i.e., technology, structure, culture, and incentive), and knowledge process capability, which includes four variables (i.e., acquisition, conversion, application, and protection). Also, organizational performance consists of four aspects of the Balanced Scorecard: financial, customer related, internal business process, and learning & growth aspects. The main research model of this study (Figure 3) was comprised of combinations of unobserved (latent) variables (i.e., knowledge infrastructure, knowledge process capabilities, and organizational performance) and observed variables (i.e., technology, structure, culture, incentive, acquisition, conversion, application, protection, financial, customer related, internal business process, and learning & growth), and attempted to identify structural relationships among these combinations. Observed variables are those that can be directly observed, whereas latent variables cannot be directly observed, but are comprised of several observed variables. Structural equation modeling (SEM) is mostly used to describe causal relationships among unobserved (latent) and observed variables (Schumacker &

Lomax, 2010). Therefore, A SEM is appropriate for studies where there are several unobservable variables that are measured by observed values from survey instruments. The SEM takes into account all of the different observed values that are used to measure the unobservable variables (Byrne, 2001).

The SEM is a statistical procedure that is similar to the multiple regression procedure, where several independent variables can be fit into the model at the same time. However, when SEM is compared to the multiple regression procedure, it can be a more powerful process because it is possible to account for interactions, nonlinearities, correlated independents, measurement error, correlated error terms, and multiple latent independents (Raykov & Marcoulides, 2006). Latent variables, also called factors, are those which comprise a combination of observed variables. For the current study, the latent variables included the eight different knowledge management capabilities as well as the four perspectives of organizational performance.

Observed variables are represented by square- or rectangular-shaped boxes, whereas those that are unobserved are represented by elliptical-shaped objects. In SEM, the relationships between the observed and unobserved variables are represented by a one-way arrow from the unobserved to the observed variable. The one-way arrow indicates that the unobserved variable is measured or comprised of the observed variables in which the arrows are connected. For the study, there were observed variables taken from the survey instrument to measure the latent variables. The model for this study was created to illustrate the relationships between the independent and dependent variables. The independent variables (knowledge infrastructure and process capabilities) in the model were those assumed to predict or impact a dependent variable (organizational performance).The relationship between the independent and dependent variables

were accomplished by connecting them through paths (Byrne, 2001). The basic diagrams relations between observed variables, latent variables, and errors. The factors might be correlated, and were represented by curved arrows; the straight arrows represented regression coefficients. The latent variables were assumed to be causes of the observed variables, and this was represented by a straight arrow with a single head. The direction of a single head meant the direction of cause to effect. Once the models were created, the analysis provided information regarding the relationships between the eight different knowledge management capabilities and four aspects of organizational performance.

The model was first tested by using SEM procedures to determine whether it was a good fit, often called as goodness-of-fit test, which is "a statistical test to find whether a model fits a set of data, whether it matches a theoretical expectation" (Vogt, 2005, p.135). A hypothesized model that has a good fit indicates that the model adequately describes the sample data. There are a few criteria for checking the model fit, but this study adopted six criteria: the chi-square, the chi-square dividing by the degree of freedom (CMIN/DF), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Root Mean square Residual (RMR), and Root Mean Square Error of Approximation (RMSEA).

The GFI is based on the ratio of the sum of the squared differences between the observed and reproduced matrices to the observed variances (Schumacker & Lomax, 2010). It ranges from zero to 1.0; a value close to 1.0 indicates a good fit. Generally, when a GFI is more than .9, it indicates that the model is relatively good-fitting (Byrne, 2001).

The CFI measures the relative improved fit in the researcher’s model when compared to the baseline model (Kline, 2005). The CFI value has a range from 0 to 1, where a CFI of 1 indicates that the chi-square statistic that assesses the fit of the model is less than the degrees of

freedom, not that the model resulted in a perfect fit. In general, a CFI of approximately .95 indicates that the model is relatively good-fitting (Byrne, 2001).

The RMR is "the average residual value derived from the fitting of the variance-covariance matrix for the hypothesized model to the variance-covariance matrix of the sample data" (Byrne, 2001, p.83). The smaller the RMR, the better the model. An RMR of zero indicates that the model is a perfect fit. In general, when a RMR is smaller than .05, it indicates that the model is relatively good-fitting.

The RMSEA is another fit index that assesses how well the proposed model fits the data. The RMSEA statistic takes into account the error of approximation in the population (Byrne, 2001). It then assesses how well the model fits the population covariance matrix if the population covariance matrix was available. Values of the RMSEA that are around .05 or less indicate that the model provides a quality fit. On the other hand, an RMSEA of around .08 to .10 indicates that the fit of the model is questionable, while an RMSEA greater than .10 indicates a poor-fitting model. Each of these fit indices were used to assess the fit of the model for the internal relationship within eight different knowledge management capabilities aspects.

If the model was found to be deficient, another model might be fit to the data that was suggested by the SEM modification indexes. When a good-fitting model was found, the SEM model was assessed to determine whether there were significant relationships between the observed and unobserved variables in the study.

1. What is the impact of knowledge management capabilities on organizational performance in the South Korean business environment?

    1-b. How do the eight variables of knowledge management capabilities relate to the four perceptual variables of organizational performance in the South Korean business environment?

The second secondary research (1-b) question attempted to identify the individual relationships between eight independent variables of knowledge management capabilities and the four aspects of organizational performance. Multivariate multiple regression was applied for this research question, to handle cases where there was more than one dependent variable to be analyzed concurrently (Johnson & Wichren, 2002).

The multiple regression was used to provide a simultaneous analysis of multiple independent and dependent variables (Tabachnick & Fidell, 1989). Usually, multiple regression is used when there are three or more measurement variables, and could determine "the magnitude of the relationship between a criterion variable and a combination of two or more predictor variables" (Gall, Gall, & Borg, 2003, p. 340). Also, it enables understanding of the functional relationships between the dependent and independent variables and allows the researcher to see what might be causing the variation in the dependent variables. If the null hypothesis was rejected, it could be concluded that there was a statistically significant relationship between independent variables and dependent variables. In this study, 32 possible combinations of the null hypothesis were identified (Table 2). If the null hypothesis was rejected, the relationship between two variables was statistically significant.

1. What is the impact of knowledge management capabilities on organizational performance in the South Korean business environment?

    1-c. How do the eight variables of knowledge management capabilities relate to the objective financial organizational performance in the South Korean business environment?

For the third secondary research question (1-c), which was to examine how each variable of the knowledge management capabilities was correlated with the objective financial organizational performance, a simple linear regression was also used. Simple linear regression

aims to find a linear relationship between two variables (Glass & Hopkins, 1996). Since this research question attempted to identify the relationships between eight independent variables of knowledge management capabilities and the objective financial organizational performance (Tobin's *q*), there were eight possible null hypotheses (Table 3). If the null hypothesis was rejected, the relationship between the two variables was statistically significant.

The second research question.

2. What is the internal relationship among the eight different knowledge management capabilities aspects?

For the second research question that attempted to evaluate the internal relationship within eight different knowledge management capabilities aspects, a Pearson's correlation analysis was conducted (Figure 4). Pearson's correlation coefficients were used to determine whether a relationship existed between two continuous variables (Burns & Grove, 2005). Since Pearson's correlation coefficients are used to measure the degree of linear relationship between two variables that are measured on interval or ratio scales (Burns & Grove, 2005), they were used to determine whether there was a relationship between two continuous variables.

The main difference between the simple linear regression and Pearson's correlation coefficients is whether it is standardized or unstandardized. For example, a regression line is "the line that comes closest to the points on the diagram," which can be made into the estimated regression equation to predict the value of the dependent variable given values for the independent variables (Vogt, 2005, p.233). Therefore, estimates of the parameter values of the simple linear regression are unstandardized and can be varied depending on the models. On the other hand, Pearson's correlation coefficients are standardized, which range between -1.0 to +1.0, and concern "the degree to which the points come close to the line" (Vogt, 2005, p.233). Since Pearson's correlation coefficients are standardized, it can be used to compare the degree of

correlation coefficients between models; therefore, it was more appropriate for this research question.

This procedure indicated whether there was a positive or negative relationship between the variables in the study. A positive relationship indicated that when one variable increased, the other variable increased as well. A negative relationship indicated that when one variable increased, the other variable decreased. Pearson's correlation coefficients were used to determine the internal relationships among the eight knowledge management capabilities aspects.

The third research question.

3. Do differences in practicing knowledge management exist between the upper 100 companies in the KOSPI 200 and the lower 100 companies in the KOSPI 200 organizations?

The third research question attempted to identify the group differences between the upper and lower 100 KOSPI 200 organizations in implementing knowledge management capabilities. Student's t-test was used to compare mean differences between two independent groups (De Vaus, 2002). The basic assumption is that the populations sampled are normally distributed and that they are of homogeneous variance, which could refer that the null hypothesis that the difference between two population means is equal to some value (Cohen, 1988; Kirk, 1995). If the null hypothesis was rejected, it meant that there was a mean difference statistically two independent groups.

The fourth research question.

4. Do differences exist between manufacturing and non-manufacturing organizations in the KOSPI 200?

The fourth research question attempted to identify the group differences between manufacturing and nonmanufacturing KOPSI 200 organizations in implementing knowledge management capabilities. Student's t-test was used to compare mean differences between two

independent groups (De Vaus, 2002). The main assumption of the t-test is to determine if two groups' means are equal. If the hypothesis was rejected, there was mean difference between two groups.

Summary

Chapter 3 discussed the research methodology that was used in the current study. The research methodology was a quantitative correlational research design used to determine the linear relationship between two continuous variables (Burns & Grove, 2005). A quantitative research design was more appropriate for the proposed study than a qualitative one because with the latter, the researcher would be unable to assess a direct relationship between two variables (Cozby, 2008).

Also included in Chapter 3 was information on the data collection process as well as the proposed statistical analyses: an SEM, a multiple regression, a simple linear regression, a Pearson’s correlation analysis, and a Student's t-test. The data for this study were collected via online survey instruments and from the archival data sources.

Chapter 4

Results

The main purpose of this study was to identify the relationship between knowledge management capabilities and organizational performance. In general, knowledge management capabilities are comprised of knowledge infrastructure and knowledge process capabilities. Knowledge infrastructure capability consists of technology, structure, culture, and incentive, while knowledge process capability includes acquisition, conversion, application, and protection. Organizational performance is measured in four aspects: financial, customer-related, internal business process, and learning & growth, which represents the four aspects of the Balanced Scorecard. Identifying the relationship between knowledge management capabilities and organizational performance could provide a strong evidence of whether an organization's investment pays off in terms of demonstrable organizational performance improvements. Therefore, this study primarily attempted to identify the relationship between knowledge management capabilities and organizational performance in four different aspects.

This chapter consists of two major sections: the result of the pilot study and of the main research according to the research questions. The research questions of the study were:

1. What is the impact of knowledge management capabilities on organizational performance in the South Korean business environment?

    1-a. What kinds of structural relationships between knowledge management capabilities and the four perceptual aspects of organizational performance exist in the South Korean business environment?

    1-b. How do the eight variables of knowledge management capabilities relate to the four perceptual variables of organizational performance in the South Korean business environment?

    1-c. How do the eight variables of knowledge management capabilities relate to the objective financial organizational performance in the South Korean business environment?

2. What is the internal relationship among the eight different knowledge management capabilities aspects?

3. Do group differences exist between upper the 100 KOSPI 200 and the lower 100 KOSPI 200 organizations in practicing knowledge management capabilities?

4. Do group differences exist between manufacturing KOPSI 200 and non-manufacturing KOSPI 200 organizations?

Results of the Pilot Study

Introduction.

The pilot study was conducted from July 13 to August 25, 2009, with 33 South Korean-based organizations, who are clients of one major HR consulting firm in South Korea. A total of 134 middle managers participated in the pilot study, and of those, 116 were used for the data analysis.

A main objective of the pilot study was to reduce numbers of survey items, as well as to determine whether certain questions could be loaded to specific variables. One of the biggest challenges for distributing a survey is to design the numbers of survey items to elicit the greatest response rate. More survey items could extract more information from participants, but at the same time, more items could result in fewer responses. A non-response bias could occur when answers of responders differ in some way from potential answers of those who did not participate; therefore, it was important to increase the response rate and reduce non-response bias by reducing the survey length or providing incentives (Dillman et al., 2009). In this study, there were134 survey items at first, including general information, knowledge management capabilities, and organizational performance. It was necessary to confirm whether the meanings of each item were the same as the original meanings because the survey was translated into

Korean. Thus, in order to reduce the number of items for a better response rate, and to make sure that the same definitions and meanings reached the intended target population, a pilot study was conducted.

Results of the strategy to reduce survey items.

The numbers of survey items were based on a statistically appropriate strategy. For the item reduction strategy, two statistical methods were used: Cronbach's α, which measures 'corrected item-total correlation' and communalities, and Exploratory Factor Analysis (EFA). Figure 7 shows the flowchart of the item reduction strategy.

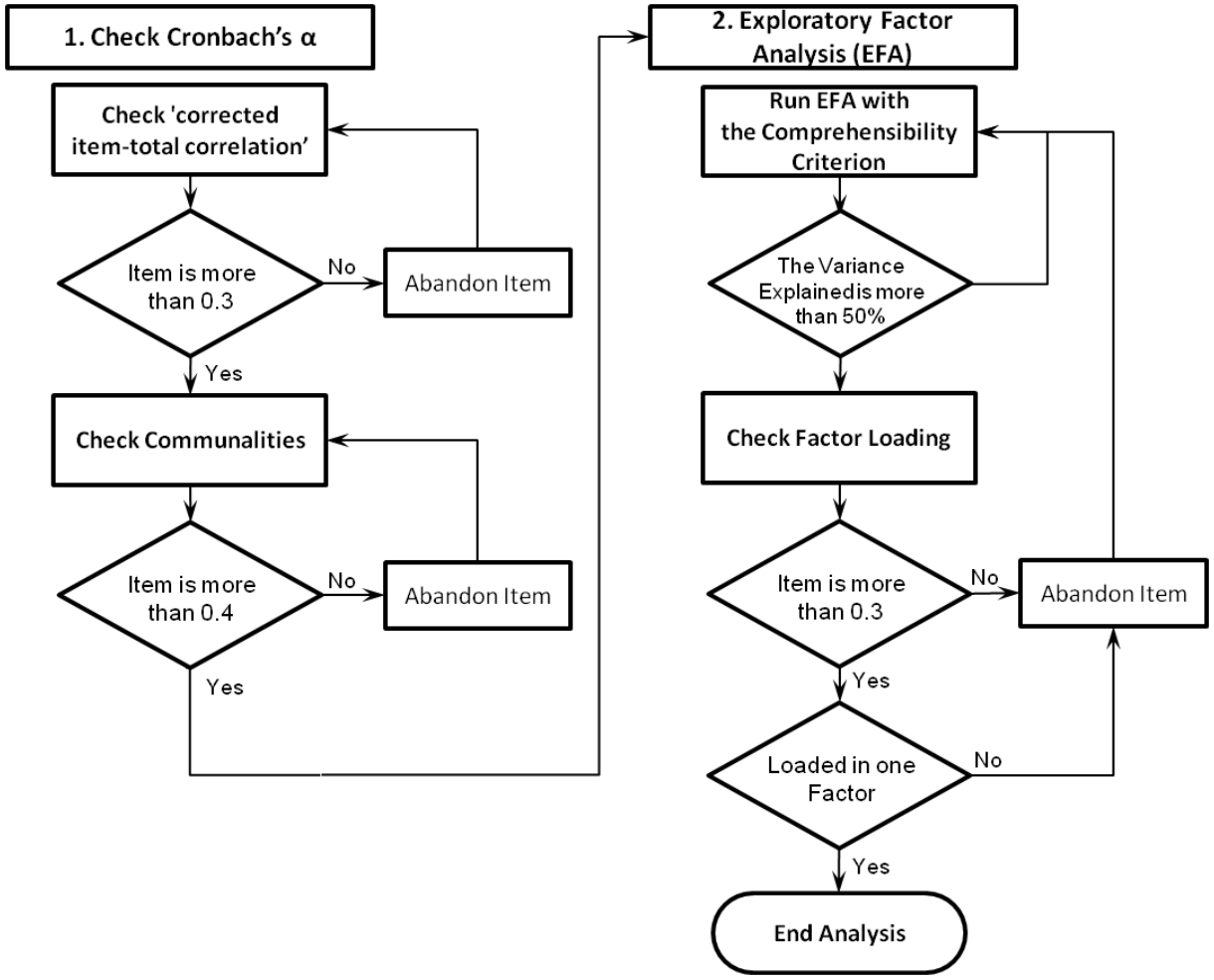

Figure 7. The flowchart of the item reduction strategy.

Survey items less than 0.3 of ’corrected item-total correlation' were dropped from the study. 'Corrected item-total correlation' is that which exists between one item and the rest of the items, so that if the correlation is low, it means that the item is not really measuring the same thing the rest of items are attempting to measure. Next, communalities were investigated. Communalities are the variances in common between the factors and the item, and the amount of variance in a variable that could be explained by the extracted factors (De Vaus, 2002). Potentially problematic items have less communalities and cannot explain their loaded factors well. Thus, survey items of less than 0.4 of communalities were dropped from the study.

Thereafter, EFA was conducted, based on knowledge infrastructure capability (e.g., technology, structure, culture, and incentive), knowledge process capability (e.g., acquisition, conversion, application, and protection), and organizational performance (e.g., customer-related, internal business process, and learning & growth). EFA is "factor analysis conducted to discover what latent variables (factors) are behind a set of variables or measures" (Vogt, 2005, p. 113). In general, there are several criteria for determining the number of factors, but this study focused on the comprehensibility and the variance-explained criteria. The comprehensibility criterion is not strictly a mathematical criterion; it limits the number of factors to those whose dimension of meaning is readily comprehensible (Garson, 2010). In this study, the researcher limited the number of factors for each latent variable, as namely, knowledge infrastructure capability (four factors: technology, structure, culture, and incentive), knowledge process capability (four factors: acquisition, conversion, application, and protection), and organizational performance (three factors: customer-related, internal business process, and learning & growth). Since items of the perceptual financial aspect of organizational performance were added to the survey after the pilot study was implemented, organizational performance was limited to three factors.

However, the comprehensibility criterion is typically used with other criterion, and this study adopted the variance-explained criterion, which is the percentage of total variance extracted, and tells how much the extracted factors are accounted for within the latent variable (Gorsuch, 1983; Vogt, 2005). Realistically, it is acceptable when the variance explained is around 50 - 75% (Neill, 2008). In knowledge infrastructural capability, four factors (i.e., technology, structure, culture, and incentive) could explain 63.56%; in knowledge process capability, four factors (i.e., acquisition, conversion, application, and protection) could explain 64.73%; and, in organizational performance, three factors (i.e., customer-related, internal business process, and learning & growth) could explain 57.31%, which could be considered acceptable. Appendix B shows the results of EFA analysis.

Lastly, the factor loading of each item was examined. Factor loading has to do with correlations between items and certain components (Gorsuch, 1983). De Vaus (2002) mentioned that the higher the loadings, the more the variables belong to the components. It is critical that an item should be designed to address what it purports to measure. If the item is loaded less than 0.3, it should be dropped from further analysis (Hair et al., 2006). Moreover, survey items were dropped if they loaded on more than one factor or loaded no factors. In this context, if an item is loaded in several components, and clashes with several components, it should be excluded. Also, if the item is not loaded in any components, it might be meaningless, and thus, should be excluded. Once the items were excluded, the EFA procedure was repeated with the remaining items until there were no problematic items.

The primary target for this study was South Korean middle managers, so the original instrument written in English was translated into Korean. During the translation procedure, the actual meaning could be distorted due to using different vocabularies or fitting to the South

Korean business terms, which could be referred to as translation nuances. In this study, the back translation procedure was adopted to prevent translation nuances. Nonetheless, there were some translation nuances which could affect the EFA procedure. Some items were loaded at different components, which was different from the original study. For example, in the knowledge process capability section, APP2 'My organization has processes for converting knowledge into the design of new products/services,' APP3, 'My organization has processes for using knowledge in development new products/services,' APP4, 'My organization has processes for using knowledge to solve new problems,' and APP5, 'My organization matches sources of knowledge to problems and challenges' were loaded to Conversion Process (Table 18). In those items, the words ‘applying,’ ‘using,’ and ‘matches,’ are similar to ‘converting’ when they are translated into Korean. In this pilot study, participants recognized some items from the application process as the conversion process. Also, IB7, ‘My organization has better R&D cycle time for services/products than our competitors (length of time from conception to introduction),’ was recognized as Customer Related Performance; therefore, it was moved to Customer Related Performance. Tables17 and 18 show the final results of the EFA in knowledge infrastructure capability and knowledge process capability, and Table 19 shows the final results of the EFA in organizational performance.

Table 17

The Results of the EFA Procedure in Knowledge Infrastructure Capability Items

Item		Component 1	2	3	4
Technology					
My organization uses technology that allows …					
TI6	People in multiple locations to learn as a group from a single source or at a single point in time	.026	-.119	**-.772**	.130
TI7	People in multiple locations to learn as a group from a multiple source or at multiple points in time	.182	-.057	**-.473**	-.136
TI8	It to search for new knowledge	.026	-.119	**-.772**	.130
TI9	It to map the location (i.e. an individual, specific system, or database) of specific types of knowledge	-.162	.061	**-.887**	-.176
TI10	It to retrieve and use knowledge about its products and processes	-.065	-.090	**-.913**	-.027
TI11	It to retrieve and use knowledge about its markets and competition	-.045	.184	**-.556**	-.023
Structure					
My organization('s)…					
SI6	Designs processes to facilitate knowledge exchange across functional boundaries	.076	.095	-.137	**-.656**
SI8	Encourages employees to go where they need for knowledge for errors/mistakes	.076	.095	-.137	**-.656**
SI9	Managers frequently examine knowledge for errors/mistakes	-.057	-.050	-.046	**-.862**
SI10	Structure facilitates the transfer of new knowledge across structural boundaries	.285	-.063	-.009	**-.577**
Culture					
My organization uses technology that allows …					
CI2	High levels of participation are expected in capturing and transferring knowledge	**.549**	.067	-.073	.142
CI6	Employees encouraged to ask others for assistance when needed	**.743**	-.111	.041	-.142
CI7	Employees encouraged to interact with other groups	**.838**	-.069	.227	-.071
CI8	Employees are encouraged to discuss their work with people in other workgroups	**.719**	.060	.065	-.074
CI9	Overall organizational vision is clearly stated	**.742**	-.018	-.109	.140
CI10	Overall organizational objectives are clearly stated	**.791**	-.017	-.082	.130
CI11	Shared its knowledge with other organizations (e.g. partners, trade groups)	**.719**	.037	.064	.039

(continued)

Table 17 (continued)

Item		Component 1	2	3	4
CI12	The benefits of sharing knowledge outweigh the costs	**.549**	.067	-.073	.142
Incentive					
My organization uses technology that allows …					
II2	Offers monetary incentives or other financial rewards for sharing knowledge with the firm or other co-workers	.042	**.938**	-.040	.185
II3	Offers monetary incentives or other financial rewards for sharing knowledge within groups and teams	-.024	**.967**	.045	.002
II4	Offers monetary incentives or other financial rewards for sharing knowledge between groups and teams	-.019	**1.010**	.096	.034
II5	Offers monetary incentives or other financial rewards (e.g. raises or bonuses) for contributions made to a knowledge repository or electronic database	-.075	**.894**	-.043	.048
In my Organization,					
II11	Individuals are visibly rewarded for teamwork, knowledge sharing and re-use of knowledge	.087	**.589**	.132	-.324

Note. TI - Technology Infrastructure, SI - Structure Infrastructure, CI - Culture Infrastructure, II - Incentive Infrastructure.

Table 18

The Results of the EFA Procedure in Knowledge Process Capability

Item		Component 1	2	3	4
Acquisition Process					
My organization…					
AQP1	Has processes for acquiring knowledge about our customers	-.145	.227	.017	**.826**
AQP 2	Has processes for generating new knowledge from existing knowledge	.374	.051	.058	**.462**
AQP 3	Has processes for acquiring knowledge about our suppliers	.101	-.086	.188	**.665**
AQP 9	Has processes for acquiring knowledge about competitors within our industry	.346	-.079	-.108	**.627**

(continued)

Table 18 (continued)

Item		Component 1	2	3	4
AQP 10	Has processes for benchmarking performance	.052	-.075	.294	**.400**
Conversion Process					
My organization…					
CP1	Has processes for converting knowledge into the design of new products/services	**.699**	-.049	.097	.137
CP2	Has processes for converting competitive intelligence into plans of action	**.834**	-.093	.042	.009
CP3	Has processes for filtering knowledge	**1.023**	-.102	-.077	-.174
CP4	Has processes for transferring organizational knowledge to individuals	**.813**	.081	-.002	-.093
CP5	Has processes for absorbing knowledge from individuals into the organization	**.873**	.118	.007	-.138
CP8	Has processes for integrating different sources and types of knowledge	**.825**	-.042	-.172	.068
CP9	Has processes for organizing knowledge	**.778**	.095	-.038	.082
APP2	Has processes for applying knowledge learned from experiences	**.769**	-.062	-.006	.012
APP3	Has processes for using knowledge in developing new products/services	**.613**	-.059	.164	.090
APP4	Has processes for using knowledge to solve new problems	**.602**	.087	.099	.133
APP5	Matches sources of knowledge to problems and challenges	**.654**	.134	.134	-.023
Application Process					
My organization…					
APP6	Uses knowledge to improve efficiency	-.063	-.025	**.980**	-.086
APP7	Uses knowledge to adjust strategic direction	-.042	-.018	**.954**	-.026
APP8	Is able to locate and apply knowledge to changing competitive conditions	.003	-.104	**.922**	-.044
APP9	Makes knowledge accessible to those who need it	-.001	.009	**.650**	.056
Protection Process					
My Organization…					
PP1	Has processes to protect knowledge from inappropriate use inside the organization	.126	**.662**	-.103	.121
PP2	Has processes to protect knowledge from inappropriate use outside the organization	-.170	**.869**	-.060	.176
PP3	Has processes to protect knowledge from theft from within the organization	.185	**.726**	-.203	-.010

(continued)

Table 18 (continued)

Item		Component 1	2	3	4
PP6	Has technology that restricts access to some sources of knowledge	-.140	**.885**	.095	-.047
PP7	Has extensive policies and procedures for protecting trade secrets	-.121	**.929**	-.026	-.043
PP9	Knowledge that is restricted is clearly identified	.080	**.800**	-.036	-.130
PP10	Clearly communicates the importance of protecting knowledge	.039	**.816**	.128	-.210

Note. AQP - Acquisition Process, CP - Conversion Process, APP - Application Process, PP - Protection Process.

Table 19

The Results of the EFA Procedure in Organizational Performance

Item		Component 1	2	3
Customer-Related Perspective				
In my organization…				
CR2	The number of services/products that we provide has improved	.018	-.220	**.594**
CR4	The number of people who use our services/products has increased	-.136	-.008	**.790**
CR5	The demand for the services/products that we provide has increased	.009	.056	**.797**
My organization…				
CR12	Introduces innovative and unique functional services/products more often than our competitors	.168	-.132	**.454**
IB7	Has better R&D cycle time for services/products than our competitors (length of time from conception to introduction)	.206	-.049	**.495**
Internal Business Process Perspective				
My organization…				
IB2	Has improved our quality control processes	-.020	**-.714**	.132

(continued)

Table 19 (continued)

Item		Component 1	2	3
IB3	Has improved our service/product delivery processes	-.150	**-.891**	-.019
IB4	Has developed policies and procedures to increase customer satisfaction	-.114	**-.878**	.078
IB5	Consistently follows service/product quality protocols	.132	**-.670**	-.104
In my organization…				
IB11	Program planning is based upon our mission	.250	**-.506**	.057
IB12	Management makes it easier to achieve our mission	.260	**-.424**	.169
Learning & Growth Perspective				
In my organization…				
LG6	In a normal work week I receive enough information to perform my job	**.773**	-.182	-.173
LG7	I have enough information to make optimal decisions to accomplish my performance objectives	**.773**	-.182	-.130
My organization…				
LG10	Provides the training that I need to meet my job requirements	**.743**	.088	.221
LG11	Provides training that is linked to organizational goals and objectives	**.617**	-.062	.190
LG12	Provides necessary equipment/tools to accomplish my performance objectives	**.738**	.235	.202

Note. CR - Customer Related Perspective, *IB* - Internal Business Perspective, *LG* - Learning & Growth Perspective

Additionally, four survey items related to financial performance were added after the pilot study (Table 16). Since survey items about other organizational performance perspectives (customer-related, internal business process, and learning & growth) were based on the participants' perceptions, it was necessary to include perceptual items about the financial aspect of organizational performance. These items were created according to the following considerations. First, items should be suitable for both manufacturing and nonmanufacturing

organizations. For example, some items such as asking about inventory turnover might not be an appropriate item for nonmanufacturing organizations. Second, items similar to other organizational performance perspectives were not included in order to prevent blurring the results of exploratory factor analysis. Inasmuch as many financial measurement items are based on complex accounting or economic theories, which might not be understood by some middle managers, the items about the financial aspect of organizational performance were based on fundamental financial measures, such as asset utilization, net income, sales, and market value.

As a result of the pilot study, numbers of items were reduced from 134 to 76, and some of the items were moved to other perspectives. The modified KMC instrument was used for the main data collection process.

The Main Study

Sample characteristics.

In this study, the knowledge management capabilities survey was distributed online to middle managers who agreed to participate in the survey from the participating organizations in the KOSPI 200., The organizational results were derived from an average of individual responses from each organization.

The list of KOSPI 200 organizations was not fixed, rather it was chosen by the Korean Exchange based on factors such as liquidity and how well they represent their respective markets and industries. The KOSPI 200 for this study was based on December 30, 2009, the last day of stock exchanging in South Korea.

In this study, there are two main steps for the recruitment process. In the first step, the researcher had to identify which KOSPI 200 organizations would participate in the study,

because some KOSPI 200 organizations might have a policy for not sharing their information to others. Also, it was impossible to know contact information of all middle managers from the KOSPI 200, the researcher had to contact the KOSPI 200 organizations to get contact information of their middle managers. The researcher contacted all KOSPI 200 organizations through emails or phone calls, which were obtained from each company's website and phone directory. Of the 200 organizations in the KOSPI 200, 39 organizations did not respond to the researcher's contact or otherwise refused to participate to the study. If organizations refused to participate to the study, there was no additional request for participating in the study. However, if organizations did not respond, the researcher sent two more emails or called them twice more. 34 organizations did not respond, whereas 5 organizations refused to participate. Therefore, the study started with 161 KOSPI 200 organizations.

The second step for the recruitment process was the actual data collecting process. Within the 161 KOSPI 200 organizations, which were willing to participate in the study, two or more middle managers were invited to the survey. The contact information of middle managers from 161 KOSPI 200 organizations was obtained from company's website, phone directory, and walk-in visits. However, the entire data collection process did not occur in 161 KOPSI 200 organizations at once, but was obtained one by one from organizations. Whenever the researcher obtained the contact information from the organization, he sent the invitations to middle managers there. The researcher collected data from 12 organizations and distributed 46 invitations. Participants in the study included 24 middle managers from 9 organizations, which resulted in a 52.2% of the response rate. The researcher found that many participants requested compensation for completing the survey, because the survey was long enough to disrupt their

working, and they were accustomed to being compensated for filling out surveys in the South Korean business culture.

After collecting data from first 9 organizations, the researcher provided two movie tickets as the compensation. Participants who finished the survey completely received the movie tickets. The researcher sent the compensation only if the participants who completed the survey, included personal data (name, address, email address, and telephone number). Participants' personal information was only used for sending the movie tickets, and was deleted thereafter. A total of 612 invitations were sent to 131 organizations, and 321 middle managers started the survey, but only 273 middle managers from 97 organizations finished the survey completely, which is a 44.6% response rate.

Table 20

The Recruitment and Response Rate of the Study

The First Step of the Recruitment and Response Rate

	Invited	Agreed to Participate	Refused to Participate	Did not Respond	Response Rate
Initial Contact	200	161	5	34	80.5%

The Second Step of the Recruitment and Response Rate

	Organization			Individuals		
	Invited	Participated	Response Rate	Invited	Participated	Response Rate
First Attempt	12	9	75%	46	24	52%
Second Attempt	131	97	78.9%	612	273	44.6%
Third Attempt	18	14	78%	72*	33	45.8%
Total	161	120	75%	730*	330	45.2%

Note. * indicates approximate number.

Furthermore, some organizations were sensitive to distributing the survey. In those cases, the researcher contacted a person from each organization to distribute the survey: 18

organizations were contacted, and 33 middle managers from 14 organizations completed the survey. However, the actual response rate is unknown because the researcher was not sure how many invitations were distributed within the organization.

The researcher also sent follow-up notification emails four times biweekly. Overall, approximately 730 middle managers from 161 KOSPI 200 organizations were invited to participate in this study, but 400 among them did not start or complete the survey, and were excluded from further analysis. In all, 330 middle managers from 120 KOSPI 200 organizations completed the survey for further analysis.

The total response rate was 45.2%. Although the response rate for online surveys was varied based on survey length, sample size, or target samples, one meta-data analyzed study indicated that most surveys received more than 26%, whereas the total average was 32.52% (Hamilton, 2009). Therefore, this is considered a successful response rate for an online survey. Table 20 shows the response result of the study.

Demographic information of the participating KOSPI 200 organizations.

The list of the 200 KOSPI on December 30, 2009 consisted of 142 manufacturing organizations (71%) and 58 nonmanufacturing organizations (29%). In this study, the 120 sample organizations consisted of 81 manufacturing organizations (67.5%) and 39 nonmanufacturing organizations (32.5%). The distribution of the sample organizations represented a cross-section of the KOSPI 200 organizations. Table 21 contains descriptive statistics for the sample organizations.

Table 21

The Descriptive Statistics

Demographic variables	KOSPI 200 organizations	Respondent organizations
Manufacturing	142 (71%)	81 (67.5%)
Food	17	13
Tobacco	1	1
Fabric & Leather	7	5
Wood	1	1
Paper	5	4
Coke & Petroleum	3	2
Chemical & Pharmaceutical	39	19
Rubber & Plastic	5	1
Metal & Non-Metal Mineral	21	7
Metallic Assembly	3	1
Machinery & Equipment	8	6
Computer	1	1
Basic Electronic	5	2
Electronic	11	7
Medical Machinery	1	1
Automobile & Trailer	7	4
Conveyance Machinery	6	5
Furniture	1	1
Nonmanufacturing	58 (29%)	39 (32.5%)
Oil, Gas, & Electricity	2	2
Construction	4	3
Whole & Retail	14	9
Logistics	5	3
Telecommunication	2	2
Financial	19	12
Business & Technology Service	8	6
Education	1	1
Entertainment	2	1
Repair Service	1	0

However, in order to assure that the participating organizations represented the population, i.e., the KOSPI 200 organizations, the researcher conducted a chi-square test. The chi-square test is used to identify whether there are statistically significant differences between the observed or actual frequencies and the expected or hypothesized frequencies of variables

presented in a cross tabulation (Vogt, 2005). In this study, the researcher identified the frequency differences between the participating KOSPI 200 distribution of manufacturing and nonmanufacturing organizations and the entire KOSPI 200 distribution. The results of chi-square showed a null hypothesis: there is no statistical significant distribution difference between the participating KOSPI 200 and the entire KOSPI 200, and was accepted with a significant level of 5% (Q = .714, df = 1). This conclusion was that the study sample well represented the entire KOSPI 200 organizations.

Table 22 shows the individual participants' demographic information. In general, respondent middle managers from the KOSPI 200 were males under the age of 40. Male participants in the sample outnumbered females by 291 (88.2%) to 39 (11.8%). Almost half of the participants (150) had worked for their company more than 9 years, and 66% had worked more than 6 years. This study defined the middle manager as a person whose position is called either 'Bu-jang (부장),' 'Cha-jang (차장),' or 'Gwa-jang (과장),' or has similar responsibilities at these levels. Also, most participants were managers (174) (과장: Gwa-jang; 52.7%), and 73 were deputy general managers (차장: Cha-jang; 22.1%). However, 43 surveys were collected from assistant managers (대리: Dae-ri), who were not defined as middle managers in this study. The average working period of the assistant managers was 2.98 years, and they had served as advisors to several staff members. Therefore, 43 responses from assistant managers were included in the study.

Since this study believed that anyone in the organization with no regard to their departments can be an informant of knowledge management, the survey questions presented to the participants' departments were open-ended. Participants' answers varied, depending largely on the types of industry in which their organizations were involved. Also, the names of

departments varied among organizations, even though departments played similar functions and roles. For example, R&D departments were also referred to as the Fermentation Department, LED Display Development, DRAM PE Team, etc. The researcher classified various participants' departments into eight major departments based on their responses: General Management, Finance & Accounting, HR, R&D, Strategic & Innovation, Marketing & Sales, Production, Quality, and so on. However, 22 participants' departments were not recognizable or were too few to be categorized. For example, Infrastructure Headquarter, Housing Division, O.I. Support team, Legal Supports, Ethical Evaluation, etc. could not be categorized.

Table 22

The Individual Participants' Demographic Information

General information		
Gender	Male	291 (88.2%)
	Female	39 (11.8%)
Age	Under 30	23
	31 – 35	85
	36 – 40	133
	41 – 45	67
	46 – 50	16
	Over 50	6
Job Position	Staff Member (사원: Sa-won)	0
	Assistant Manager (대리: Dae-ri)	43
	Manager (과장: Gwa-jang)	174
	Deputy General Manager (차장: Cha-jang)	73
	General Manager (부장: Bu-jang)	40
	Director (임원: Im-won)	0
	CEO	0
Working Period	Less than 6 Months	0
	6 Months – Less than 3 Years	48
	3 Years – Less than 6 Years	62
	6 Years – Less than 9 Years	70
	More than 9 Years	150

(continued)

Table 22 (continued)

General information		
Department	General Management	46
	Finance & Accounting	67
	Human Resource	53
	R&D	26
	Strategic & Innovation	40
	Marketing & Sales	43
	Production	19
	Quality & After Servicing	14
	IT	8
	Other	14

The reliability and validity of test results.

The main purpose of the reliability and validity test was to determine the key dimensions of organizational capabilities related to knowledge management in the South Korean business environment. Without any validated instruments related to knowledge management capabilities and organizational performance, it would be impossible to identify the relationship between knowledge management capabilities and organizational performance. Since knowledge management is an emerging field in the current business environment, there are few validated instruments related to knowledge management capabilities. Moreover, this study adopted the concept of the Balanced Scorecard to measure organizational performance, because it is best measured from multiple perspectives (Kaplan & Norton, 1992). However, there are few validated instruments adopting the concept of the Balanced Scorecard. In this study, Gold's (2001) framework of knowledge management capabilities and Niven's (2002) instrument for the Balanced Scorecard were modified and adopted.

The reliability and validity tests were implemented through responses to this research question. For testing reliability, the Cronbach's α reliability coefficient was used to check the internal consistency reliability of the instrument. Cronbach's α is "a measure of the

intercorrelation of the items and estimates the proportion of the variance in all the items that is accounted for by a common factor" (Vogt, 2005, p.71). For testing validity, confirmatory factor analysis (CFA) was implemented to certify the construct validity. A CFA was performed to ascertain that the items on the survey instrument measured the hypothetical constructs that the survey intended to measure.

***Reliability*.**

To check the internal consistency reliability of the instrument, the Cronbach's α was used. In general, if the Cronbach's α is greater than 0.7, the instrument is considered very reliable, but 0.5 - 0.6 could be accepted for an exploratory study (Nunnally & Bernstein, 1994). This study showed that eight knowledge management capabilities: technology (.887), structure (.789), culture (.888), incentive (.937), acquisition (.856), conversion (.949), application (.894) and protection (.915), and four aspects of organizational performance:, customer related (.860), internal business process (.903), learning & growth (.922) and perceptual financial (.925), had relatively high Cronbach's α scores, which showed the high internal consistency reliability of the instrument. Tables 24, 25, and 26 show the results of the Cronbach's α test.

Also, the 'corrected item-total correlation' technique was checked. 'Corrected item-total correlation' exists between one item and the remaining items, so if the correlation is low, it means that the item is not measuring the same thing the rest of the items are attempting to measure. Generally, 'corrected item-total correlation' should be more than 0.3 (De Vaus, 2002). The reliabilities of all 12 constructs, including 4 constructs of knowledge infrastructure capability, 4 constructs of knowledge process capability, and 4 constructs of organizational performance, seemed to be passable.

***Validity*.**

Since Gold (2001) designed the instrument of knowledge management capabilities, several studies have been verified in Western countries (Khalifa & Liu, 2003; Smith, 2006b). This study initially attempted to translate the instrument into Korean, and to verify it in South Korea's business environment. Thus, the validity of this instrument was doubtful. The main purpose of confirmatory factor analysis (CFA) was to ascertain that the items on the survey instrument measured the hypothetical constructs the survey intended to measure. The CFA was conducted for the eight constructs of knowledge management capabilities and the four constructs of organizational performance. The eight constructs of knowledge management capabilities were composed of four constructs of knowledge infrastructure capability and four constructs of knowledge process capability, and the four constructs of organizational performance included the perceptual financial, customer related, internal business process, and learning & growth, which represent the four aspects of the Balanced Scorecard.

Validity is "a term to describe a measurement instrument or test that accurately measures what it is supposed to measure" (Vogt, 2005, p.335). In this study, it was doubtful whether each construct actually measured what it supposed to measure. Since construct validity includes the test of the hypothesized constructs which represent the concept that it intends to measure (De Vaus, 2002; Trochim, 2005), construct validity was primarily tested. In general, good construct validity could indicate a flawless theoretical basis which is translated through clear operational definitions involving measureable indicators. To test construct validity, two types of validity tests were implemented: convergent and discriminant.

Convergent validity is explained by the correlation among items which make up the scale or instrument measuring a construct, whereas, discriminant validity is primarily obtained when

several constructs are dissimilar, so it is possible to discriminate among these constructs (Bagozzi & Yi, 1988; Campbell & Fiske, 1959). For checking convergent validity, the CFA model fit, a factor loading (λ) and average variance extracted (AVE) were examined. The significance of individual item loadings (factor loading, λ) was examined using *t*-value. If the factor loadings are more than .50, items are significantly loaded on their respective latent factors (Bagozzi & Yi, 1988). Additionally, AVE was identified. In general, if AVE is at least .50, indicating that the variance explained by the construct is greater than the measurement error, convergent validity could be displayed. Table 23 shows the summary of model fit indexes for knowledge infrastructure capability (KIC), knowledge process capability (KPC), and organizational performance (OP).

To check discriminant validity, there is no single definitive test, nor is it typically established in a single study (Kline, 2005). The structural equation model of confirmatory factor analysis itself could be a powerful tool for evaluating construct validity. However, in this study, discriminant validity was ascertained by "whether the confidence interval (± two standard errors) of the correlation between the two factors includes 1.0" (Anderson & Gerbing, 1988, p. 416). The main purpose of this test is to test the hypothesis that two constructs are identical ($\emptyset = 1.0$). If the score of $\emptyset \pm 2 \times$ standard error is less than 1.0 within 95% of confidence interval, it would be acceptable to indicate that there is discriminant validity.

In this study, construct validity, including convergent and discriminant validity, was tested based on three constructs (i.e., knowledge infrastructure capability, knowledge process capability, and organizational performance).

Convergent validity of Knowledge Infrastructure Capability (KIC).

The convergent validity for KIC is examined by CFA model fit. Table 23 shows the results of CFA model fit. Checking whether the model is in good fit is often called as goodness-of-fit test, which is basically "a statistical test to whether a model fits a set of data, whether it matches a theoretical expectation" (Vogt, 2005, p.135). If the hypothesized model has a good fit, it indicates that the model adequately describes the sample data. There are a few criteria for checking the model fit, but this study adopted six criteria: the chi-square, the chi-square dividing by the degree of freedom (CMIN/DF), the Goodness of Fit Index (GFI), the Comparative Fit Index (CFI), the Root Mean Square Residual (RMR), and the Root Mean Square Error of Approximation (RMSEA) fit diagnostic statistics (see p.122).

The chi-square ($\chi^2 = 403.423$) was statistically significant (df = 217, $p < .01$), which could indicate that the suggested model is a good-fit. However, the chi-square value does not provide enough guidance in determining whether the model had a good fit (Byrne, 2001). Thus, implementing other indices of fit was recommended. The chi-square divided by the degree of freedom (CMIN/DF) for KIC was 1.859, and it fell in the range of 3 to 1, which indicated that the model had an acceptable fit. Goodness of fit index (GFI) was 0.905, which satisfied the criterion for a good-fitting model– the criterion more than 0.9. Comparative fit index (CFI) was 0.965, which also satisfied the general criteria for a good-fitting model, more than 0.9. The root mean square residual (RMR) was 0.057. In general, to satisfy the criteria for a good-fitting model, the RMR should be less than 0.05, but the RMR for this construct was generously acceptable considering the large number of items and factors (Byrne, 2001). Therefore, the decision was made to continue with the analysis. Root mean square error of approximation (RMSEA) was 0.051, which satisfied the general criteria for a good-fitting model, ranging 0.05 to 0.08. Overall,

the proposed measurement model of KIC seemed to have a good-fitting model, even though the RMR was slightly high.

Table 23

The Summary of Model Fit Indexes for Three Measurement Models

Model	$\chi 2$	df	CMIN/DF	GFI	CFI	RMR	RMSEA
KIC	403.423**	217	1.859	.905	.965	.057	.051
KPC	730.618**	308	2.372	.855	.939	.056	.065
OP	426.495**	159	2.682	.884	.950	.057	.072

Note. KIC = Knowledge Infrastructure Capability; KPC = Knowledge Process Capability; OP = Organizational Performance. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

The convergent validity for knowledge infrastructure capabilities (KIC) was assessed by examining the significance of individual item loadings (factor loading, λ) through t-test (Table 24). In the result of confirmatory factor analysis (CFA), the entire item factor loadings related to KIC were statistically significant ($p< .01$). Bagozzi and Yi (1988) mentioned that if a lambda value (λ) is less than .50, it should be deleted. However, in this study, no item factor loadings were less than .50, which were statistically significant ($p< .01$). Each value of squared multiple correlations (R^2) explained the amount of variance.

Table 24

The Confirmatory Factor Analysis of Knowledge Infrastructure Capabilities

Construct (Cronbach's α)	Variables	Factor loading (λ)	t – value	Squared multiple correlations (R^2)	Average Variance Extracted (AVE)
Technology	TI6	0.576	14.586(**)	.332	0.533
(.887)	TI7	0.628	F	.394	
	TI8	0.892	12.857(**)	.796	
	TI9	0.825	12.213(**)	.680	
	TI10	0.898	12.908(**)	.807	
	TI11	0.627	9.839(**)	.393	
Structure	SI6	0.679	F	.461	0.573
(.789)	SI8	0.609	9.945(**)	.371	
	SI9	0.656	10.620(**)	.430	
	SI10	0.790	12.493(**)	.624	
Culture	CI2	0.799	9.652(**)	.639	0.534
(.888)	CI6	0.771	9.397(**)	.594	
	CI7	0.778	9.441(**)	.606	
	CI8	0.768	9.379(**)	.589	
	CI9	0.682	8.813(**)	.466	
	CI10	0.678	8.781(**)	.460	
	CI11	0.575	9.148(**)	.331	
	CI12	0.525	F	.275	
Incentive	II2	0.844	18.187(**)	.712	0.682
(.937)	II3	0.926	20.952(**)	.857	
	II4	0.945	21.572(**)	.893	
	II5	0.777	19.273(**)	.604	
	II11	0.809	F	.655	

Note. TI = Technology Infrastructure; SI = Structure Infrastructure; CI = Culture Infrastructure; II = Incentive Infrastructure. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

If the average variance extracted (AVE) is more than 0.05, constructs display convergent validity (Fornell & Larcker, 1981). Every AVE estimates of four constructs of KIC were more than 0.05, so the proposed measurement model of KIC seemed to display convergent validity. Table 24 shows the result of the convergent validity for knowledge infrastructure capabilities.

Convergent validity of Knowledge Process Capability (KPC).

The convergent validity for KPC is examined by CFA model fit. The chi-square was (χ2= 730.618), a statistically significant ($p < .01$), which could represent that the suggested model is a good-fitting one (Table 23). Thus, it is recommended that other indexes of fit be implemented. CMIN/DF (2.372) fell in the range of 1 to 3, which indicated the model had an acceptable fit. Goodness of fit index (GFI) was 0.855, which did not satisfy the general criteria for a good-fitting model (more than 0.9). Although GFI was slightly lower than 0.9, GFI distributional properties are unknown, so there is no significance test associated with it (Jöreskog & Sorbom, 1984). Therefore, the decision was made to continue with the analysis.
The comparative fit index (CFI) was 0.939, which also satisfied the general criteria for a good-fitting model, more than 0.9. The root mean square residual (RMR) was 0.056. In general, to satisfy the criteria for a good-fitting model, the RMR should be less than 0.05, but the RMR for this construct was considered acceptable considering the large number of items and factors. Therefore, the decision was made to continue with the analysis. Root mean square error of approximation (RMSEA) was 0.065, which satisfied the general criteria for a good-fitting model, ranging from 0.05 to 0.08.

Here as elsewhere, the convergent validity for knowledge process capabilities (KPC) was assessed by examining the significance of individual item loadings (factor loading, λ) through t-test (Table 25). In the result of confirmatory factor analysis (CFA), the entire item factor

loadings related to KPC was more than 0.50, and statistically significant ($p < 0.01$). In KPC, no item factor loadings were less than .50, which were statistically significant ($p < .01$). Each value of squared multiple correlations (R^2) explained the amount of variance.

Table 25

The Confirmatory Factor Analysis of Knowledge Process Capabilities

Construct (Cronbach's α)	Variables	Factor loading (λ)	t - value	Squared multiple correlations (R^2)	Average Variance Extracted (AVE)
Acquisition	AQP1	0.74	10.326(**)	.548	0.592
(.856)	AQP2	0.859	11.286(**)	.738	
	AQP3	0.774	10.625(**)	.600	
	AQP9	0.718	10.124(**)	.516	
	AQP10	0.584	F	.341	
Conversion	CP1	0.797	17.122(**)	.635	0.652
(.949)	CP2	0.789	16.843(**)	.622	
	CP3	0.74	15.350(**)	.547	
	CP4	0.724	14.952(**)	.525	
	CP5	0.813	17.646(**)	.661	
	CP8	0.785	16.744(**)	.617	
	CP9	0.795	17.068(**)	.633	
	APP2	0.762	16.062(**)	.581	
	APP3	0.803	21.877(**)	.644	
	APP4	0.826	F	.682	
	APP5	0.792	16.980(**)	.627	
Application	APP6	0.828	13.352(**)	.685	0.756
(.894)	APP7	0.922	14.502(**)	.851	
	APP8	0.885	14.094(**)	.783	
	APP9	0.67	F	.448	

(continued)

Table 25 (continued)

Construct (Cronbach's α)	Variables	Factor loading (λ)	t-value	Squared multiple correlations (R^2)	Average Variance Extracted (AVE)
Protection	PP3	0.786	15.674(**)	.618	0.582
(.915)	PP1	0.622	11.774(**)	.387	
	PP2	0.745	14.640(**)	.555	
	PP6	0.815	16.567(**)	.665	
	PP7	0.849	17.466(**)	.721	
	PP9	0.781	17.860(**)	.609	
	PP10	0.808	F	.653	

Note. AQP = Acquisition Process; CP = Conversion Process; APP = Application Process; PP = Protection Process. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

Since the AVE estimates of four constructs of knowledge process capability were more than 0.50, the proposed measurement model seemed to display convergent validity. Table 25 shows the result of the convergent validity for the knowledge process capabilities.

Convergent validity of Organizational Performance (OP).

The convergent validity for organizational performance is examined by CFA model fit. The chi-square value ($\chi 2$= 403.423) was statistically significant ($p < 0.01$), which could represent that the suggested model is a good-fitting one. CMIN/DF (1.859) fell in the range of 3 to 1, which indicated the model had an acceptable fit. The goodness-of-fit index (GFI) was 0.905, which satisfied the general criteria for a good-fitting model, more than 0.9. The comparative fit index (CFI) was 0.965, which also satisfied the general criteria for a good-fitting model, more than 0.9. The root mean square residual (RMR) was 0.057. In general, to satisfy the criteria for a good-fitting model, the RMR should be less than 0.05, but the RMR for these constructs was generously acceptable considering the large number of items and factors. Therefore, the decision

was made to continue with the analysis. The root mean square error of approximation (RMSEA) was 0.051, which satisfied the general criteria for a good-fitting model, ranging from 0.05 to 0.08. Overall, the proposed measurement model of organizational performance seemed to be a good-fitting model, even though the RMR was slightly high.

The convergent validity for organizational performance was assessed by examining the significance of individual item loadings (factor loading, λ) through t-test (Table 26). In the result of CFA, the entire item factor loadings related to organizational performance were more than 0.5, and statistically significant ($p < 0.01$). Each value of squared multiple correlations (R^2) explained the amount of variance.

Table 26

The Confirmatory Factor Analysis of Organizational Performance

Construct (Cronbach's α)	Variables	Factor loading (λ)	t-value	Squared multiple correlations (R^2)	Average Variance Extracted (AVE)
Customer Related (.860)	CR2	0.779	11.492(**)	.607	0.582
	CR4	0.735	10.947(**)	.540	
	CR5	0.73	10.893(**)	.533	
	CR12	0.699	15.227(**)	.489	
	IB7	0.663	F	.440	
Internal Business Processes (.903)	IB2	0.795	12.667(**)	.633	0.684
	IB3	0.832	13.185(**)	.693	
	IB4	0.851	13.462(**)	.724	
	IB5	0.794	12.734(**)	.631	
	IB11	0.66	16.652(**)	.436	
	IB12	0.675	F	.455	

(continued)

Table 26 (continued)

Construct (Cronbach's α)	Variables	Factor loading (λ)	t-value	Squared multiple correlations (R^2)	Average Variance Extracted (AVE)
Learning & Growth (.922)	LG6	0.925	20.562(**)	.855	0.716
	LG7	0.932	20.753(**)	.868	
	LG10	0.745	15.14(**)	.556	
	LG11	0.705	14.085(**)	.498	
	LG12	0.807	F	.651	
Perceptual Financial (.925)	PF1	0.762	17.516(**)	.580	0.811
	PF2	0.919	25.342(**)	.844	
	PF3	0.915	25.122(**)	.837	
	PF4	0.889	F	.790	

Note. CR = Customer-related; IB = Internal Business Process; LG = Learning & Growth; PF = Perceptual Financial. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

All AVE estimates of four constructs of organizational performance were more than 0.50, so the proposed measurement model of organizational performance seemed to display convergent validity. Table 26 shows the result of the confirmatory factor analysis of organizational performance.

Discriminant validity.

Simply stated, the discriminant validity is violated when different constructs examine a similar concept, even though those constructs are distinct theoretically (Campbell & Fiske, 1959). When a pair of two constructs delivers the same concept, the correlation ($\emptyset$) between them is 1.0. The discriminant validity test in this study is to examine whether $\emptyset \pm 2 \times$ standard error (S.E.) is 1.0. If $\emptyset \pm 2 \times$ S.E. is not 1.0, it is possible that there is discriminant validity between two constructs. Table 27 shows the result of the discriminant validity test (Anderson & Gerbing, 1988; Bae, 2007).

Table 27

The Discriminant Validity Test Result

Factor combination			Correlation estimates (Ø)	S.E.	Ø - 2×S.E.	Ø + 2×S.E.
Technology	↔	Structure	0.756	0.049	0.658	0.854
Structure	↔	Culture	0.878	0.044	0.790	0.966
Culture	↔	Incentive	0.309	0.033	0.243	0.375
Technology	↔	Culture	0.652	0.038	0.576	0.728
Structure	↔	Incentive	0.487	0.047	0.393	0.581
Technology	↔	Incentive	0.387	0.044	0.299	0.475
Acquisition	↔	Conversion	0.888	0.043	0.802	0.974
Conversion	↔	Application	0.672	0.036	0.600	0.744
Application	↔	Protection	0.619	0.038	0.543	0.695
Acquisition	↔	Application	0.553	0.027	0.499	0.607
Acquisition	↔	Protection	0.522	0.036	0.450	0.594
Conversion	↔	Protection	0.617	0.045	0.527	0.707
Customer-related	↔	Internal Business	0.778	0.037	0.704	0.852
Internal Business	↔	Learning & Growth	0.602	0.034	0.534	0.670
Learning & Growth	↔	Perceptual Financial	0.588	0.041	0.506	0.670
Customer-related	↔	Learning & Growth	0.540	0.034	0.472	0.608
Customer-related	↔	Perceptual Financial	0.596	0.040	0.516	0.676
Internal Business	↔	Perceptual Financial	0.525	0.036	0.453	0.597

The results show that all combinations were acceptable to indicate discriminant validity. Based on the results, it is plausible that adequate discriminant validity exists between the items.

However, the correlated estimates of 'structure and culture' and 'acquisition and conversion' were close to 1.0. Table 27 shows the result of the discriminant validity test.

In summary, it is reasonable to conclude that the knowledge management capabilities instrument could measure two latent constructs of knowledge infrastructure capability and knowledge process capability and four latent constructs of organizational performance related to the four concepts of the Balanced Scorecard.

Research questions and results.

There were four main research questions based on the purpose of the study. The first question identified the relationship between knowledge management capabilities and organizational performance, and had three secondary research questions. The second research question explored the internal relationships among eight knowledge management capabilities. The third and the fourth research questions identified whether there were mean differences between the upper and lower 100 of the 200 KOSPI organizations, and the manufacturing and the nonmanufacturing 200 KOSPI organizations.

1. What is the impact of knowledge management capabilities on organizational performance in the South Korean business environment?

    1-a. What kinds of structural relationships between knowledge management capabilities and the four perceptual aspects of organizational performance exist in the South Korean business environment?

This research question examined the structural relationship between two latent constructs of knowledge management capabilities: knowledge infrastructure capability and knowledge process capability, and perceptual organizational performance. For this research question, the Structural Equation Modeling (SEM) was used. An SEM is appropriate for studies where there are several unobservable variables that are measured by observed values from survey instruments since SEM takes into account all of the different observed values that are used to measure the

unobservable variables (Byrne, 2001). In this study, knowledge management capabilities can be divided into two types: knowledge infrastructure and process capabilities, the unobservable variables. Each knowledge management capability includes four different capabilities: technology, structure, culture, incentive, acquisition, conversion, application and protection, the observed variables. Moreover, organizational performance (the unobservable variable) includes four aspects: financial, customer-related, internal business process, and learning & growth, the observable variables. For this reason, the SEM is the most suitable statistical analysis for this research question.

The individual level of survey data was averaged into one organizational level data per each organization. A total of 120 organizational-level data were collected among the KOPSI 200 organizations to proceed to the SEM analysis. Additionally, item's scores of each construct (i.e., technology, structure, culture, incentive, acquisition, conversion, application, protection, customer-related, internal business process, learning & growth, and financial) were averaged into one measured data based on each organization, because it is best to keep the model as simple as possible in order to explain the data well (Steele, 2010). Means and standard deviations (*SD*) are presented in Table 28.

Based on the acceptable results of exploratory and confirmatory factor analysis, the eight constructs of KMC and the four aspects of organizational performance were identified. According to these constructs, the item scores of each construct were averaged, and the scores were used as a measured variable of each construct. Table 28 shows the averaged score for each construct.

Based on 12 identified constructs, 3 latent variables were defined: knowledge infrastructure capability (KIC), knowledge process capability (KPC), and organizational

performance (OP). The major purpose of this research question was to identify the structural relationship between knowledge management capabilities and organizational performance. The SEM results showed that KIC had a negative relationship (γ = -.14, *t* = -.462), and was not statistically significant at the level of 5% (α = 0.05). Therefore, the hypothesis (H_A2-a-1), 'there is a significant relationship between knowledge infrastructure capability and perceptual organizational performance,' was not supported. The KPC had a positive relationship (γ = 1.12, *t* = 6.826**), and was statistically significant when α = 0.01. Therefore, the hypothesis (H_A2-a-2), ‘there is a significant relationship between knowledge process capability and perceptual organizational performance,' was supported.

The overall fit of the original model was insufficient, which indicated that the hypothesized model did not match the theoretical expectation (Table 29). Even though chi-square (χ^2=133.094) was statistically significant ($p < .01$), GFI (more than 0.9) and RMSEA (less than 0.08) did not satisfy conditions of the good model fit. Figure 8 shows the original model of knowledge management capabilities and organizational performance.

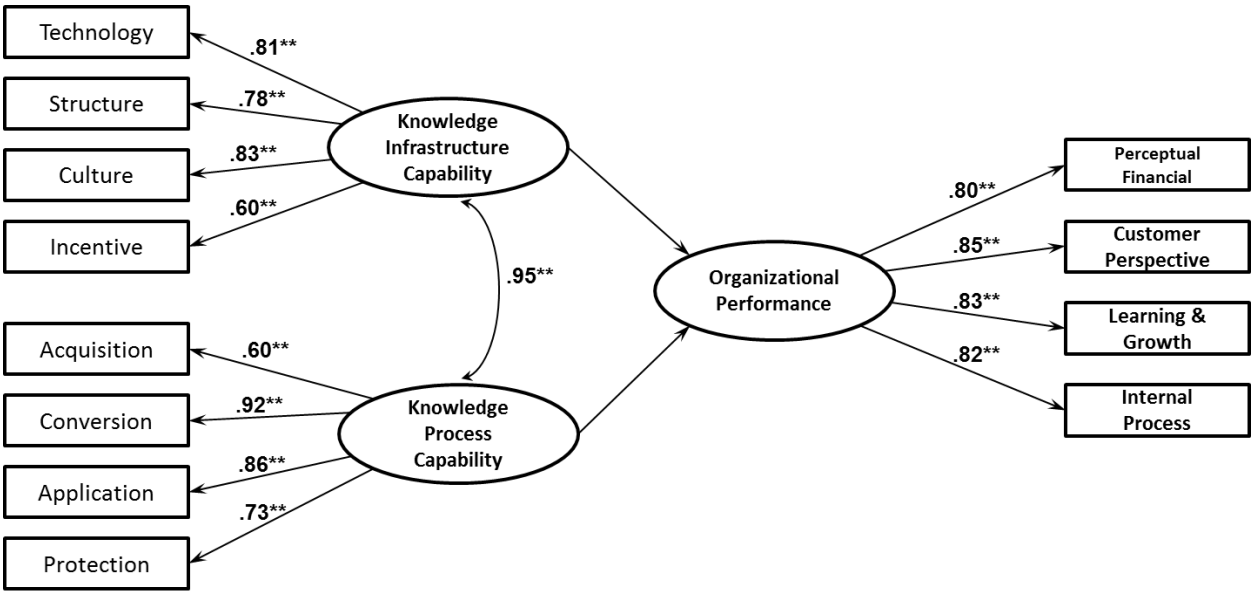

Figure 8. The Original Model of Knowledge Management Capabilities and Organizational Performance.

In general, a path coefficient (γ) falls between -1and +1 because the path coefficient is a standardized regression coefficient (Vogt, 2005). The main reason that the path coefficient between KPC and OP was more than 1.0, and that the path coefficient between KIC and OP (-0.14) was too low was due to multicollinearity. If two or more independent variables are highly correlated, there is a significant possibility that they convey essentially the same information (Grimm & Yarnold, 1995). Multicollinearity is a statistical situation when two or more independent variables are highly correlated (Vogt, 2005). In this analysis, the estimate of correlation between KIC and KPC was .951.The best way to handle multicollinearity is to understand the cause and remove it. However, highly intercorrelated independent variables might contribute significantly to the model, so another way to reduce or eliminate multicollinearity is to combine the variables (Motulsky, n.d.).

Table 28

Mean, Standard Deviation, and Pearson Correlation

Variables	Mean	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. Technology	3.983	0.646	1.000											
2. Structure	3.602	0.440	0.683**	1.000										
3. Culture	4.25	0.528	0.640**	0.688**	1.000									
4. Incentive	3.118	0.749	0.555**	0.478**	0.355**	1.000								
5. Acquisition	3.77	0.54	0.647**	0.620**	0.685**	0.513**	1.000							
6. Conversion	3.805	0.579	0.699**	0.675**	0.700**	0.626**	0.788**	1.000						
7. Application	4.291	0.592	0.646**	0.593**	0.755**	0.393**	0.641**	0.801**	1.000					
8. Protection	4.407	0.698	0.604**	0.464**	0.555**	0.411**	0.546**	0.657**	0.636**	1.000				
9. Customer-related	4.265	0.553	0.549**	0.456**	0.605**	0.420**	0.562**	0.703**	0.717**	0.621**	1.000			
10. Internal Business	4.522	0.499	0.647**	0.575**	0.714**	0.434**	0.671**	0.743**	0.741**	0.714**	0.773*	1.000		
11. Learning & Growth	4.16	0.604	0.611**	0.624**	0.742**	0.488**	0.655**	0.765**	0.701**	0.577**	0.646*	0.692**	1.000	
12. Perceptual Financial	3.898	0.651	0.591**	0.550**	0.640**	0.549**	0.683**	0.774**	0.700**	0.544**	0.660*	0.645**	0.682**	1.000

Note. $N = 120$.* is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

Since the initial conceptual model of knowledge management capabilities and organizational performance showed a phenomenon of multicollinearity, several modified models were proposed.

The first modified model assumed that if there was high correlation between KIC and KPC, they might be the same concept that could be combined into one high-order latent variable, 'Knowledge Management Capabilities (KMC).' Figure 9 shows the first modified model of knowledge management capabilities and organizational performance.

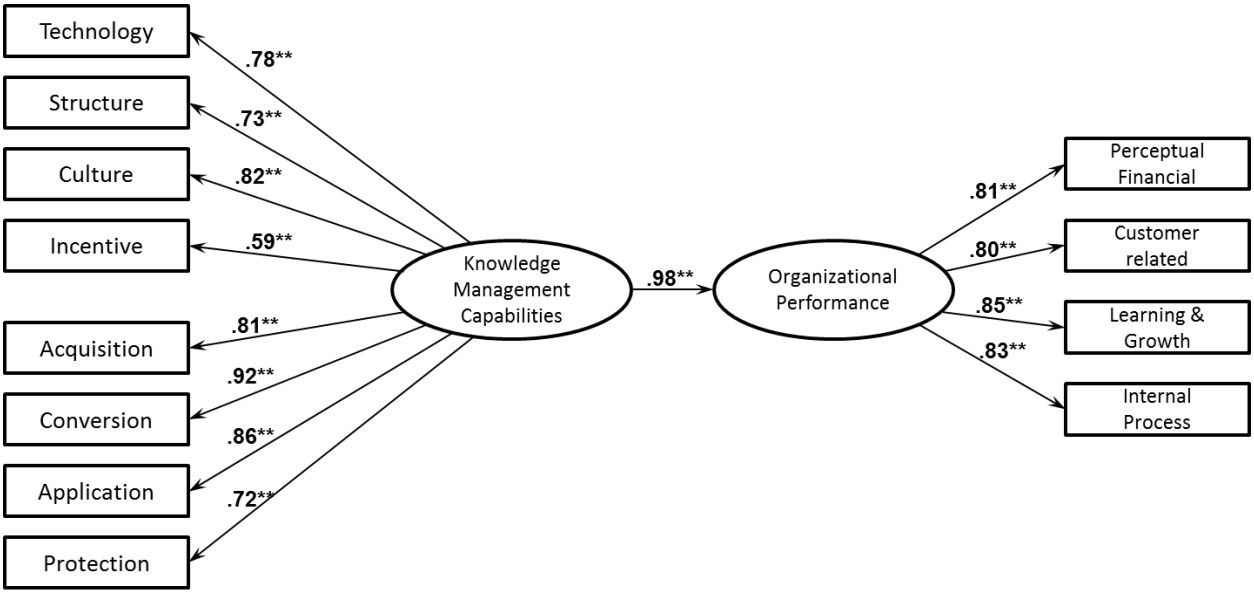

Figure 9. The 1st Modified Model of Knowledge Management Capabilities and Organizational Performance.

The first modified model showed that all model fit indicators would not satisfy the good model criteria. Although the chi-square($\chi^2 = 140.889$) test was statistically significant ($p < .01$), it increased from 133.094 to 140.889, generally the larger the chi-square, the poorer the fit (Everitt, 2006). Moreover, the goodness-of-fit index (GFI) (.829) and the comparative fit index

(CFI) (.927) were lower compared to the original model. Moreover, the root mean square error of approximation (RMSEA) was 0.118, which does not satisfy the general criteria for a good-fitting model, ranging .05 to .80. Overall, the first modified model did not match the theoretical expectation (Table 29).

The second modified model was examined by adding the higher-order latent variable, combining KIC and KPC as subordinate latent variables. The higher-order latent variable was 'Knowledge Management Capabilities (KMC),' which was a higher level concept of KIC and KPC. This assumed that there was high correlation between KIC and KPC, but they were different concepts. This modified model was well supported by the theoretical background of this study. Knowledge management capabilities include two types: knowledge infrastructure capability and knowledge process capability (Gold et al., 2001). Figure 10 shows the second modified model of knowledge management capabilities and organizational performance.

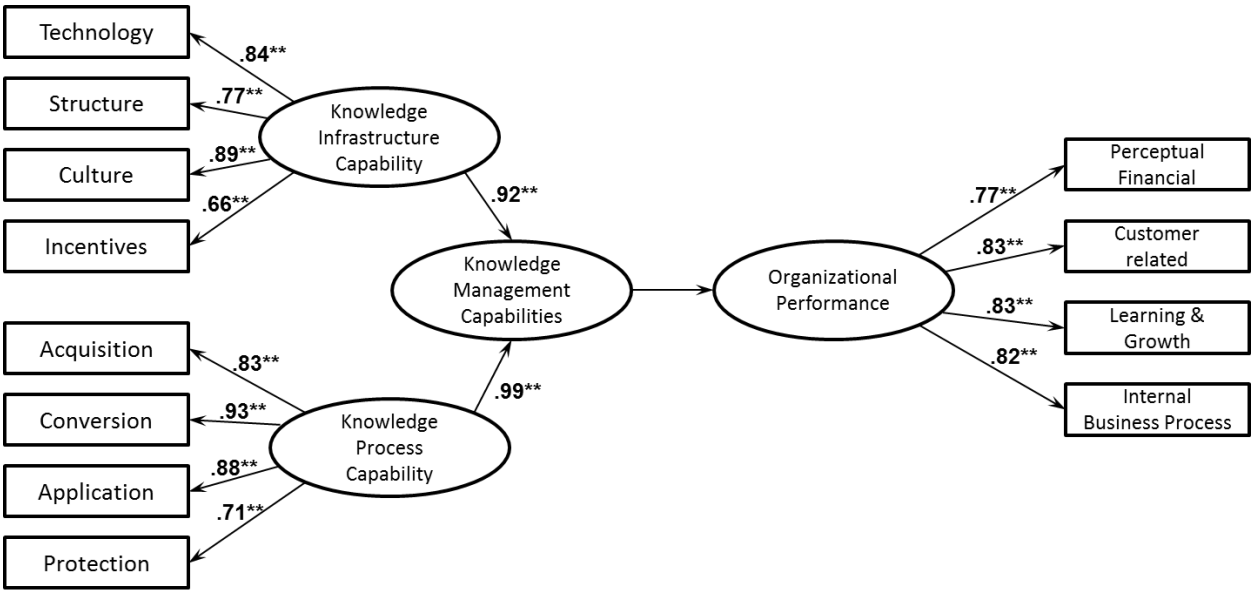

Figure 10. The 2nd Modified Model of Knowledge Management Capabilities and Organizational Performance.

For the second modified model, all model fit indicators showed a good-fitting model (Table 29). The chi-square test was statistically significant ($p < .01$). The CMIN/DF (1.634) fell in the range of 3 to 1, which indicated the model had an acceptable fit. The GFI was 0.905, which satisfied the general criteria for a good-fitting model, more than 0.9. The CFI was 0.976, which also satisfied the general criteria for a good-fitting model, more than 0.9. The RMR was 0.012, which satisfied the general criteria for a good-fitting model, less than 0.05. The RMSEA was 0.071, which satisfied the general criteria for a good-fitting model, ranging 0.05 to 0.08. Overall, the first modified model of knowledge management capabilities and organizational performance seemed to fit well.

Table 29

The Summary of Model Fit Indexes for the Original and Modified Models

Model	$\chi 2$	df	CMIN/DF	GFI	CFI	RMR	RMSEA
The Original Model	133.094**	51	2.610	.838	.931	.017	.116
The 1st Modified Model	140.889**	53	2.658	.829	.927	.017	.118
The 2ndModified Model	75.185**	46	1.634	.905	.976	.012	.073

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

In the second modified model, KIC ($\gamma = .918$, $t = 6.937$) and KPC ($\gamma = .993$, Fixed) explained knowledge management capabilities adequately. In addition, KMC ($\beta = .998$, $t = 10.315$) could explain organizational performance well. If a correlation coefficient is more than 0.9 between two variables, they could be explained almost in a straight line. Table 29 shows the comparison result of model fit indexes between the original and modified models.

Overall, the second modified model could explain the structural relationship between knowledge management capabilities and organizational performance.

1. What is the impact of Knowledge Management Capabilities on organizational performance in the South Korean business environment?

    1-b. How do the eight variables of Knowledge Management Capabilities relate to the four perceptual variables of organizational performance in the South Korean business environment?

Whereas the research question 1-a examined the relationship between knowledge management capabilities and organizational performance holistically, this research question attempted to identify specific relationships between the eight knowledge management capabilities, as independent variables, and the four aspects of organizational performance. Multivariate multiple regression, which extends the concept of multiple regression to cases where more than one dependent variable is to be analyzed concurrently (Johnson & Wichren, 2002), was applied for this research question. Multivariate multiple regression estimates the same coefficients and standard errors as one would obtain using separate ordinary least squares (OLS) regressions. The OLS method is a method for estimating the unknown parameters in a regression equation which could represent the relationship between or among variables (Vogt, 2005). For these reasons, multivariate multiple regression was the most suitable statistical analysis for this research question.

Due to the fact that independent variables (technology, structure, culture, incentive, acquisition, conversion, application, and protection), were continuous, multivariate regression analysis was used to obtain multivariate analysis of variance (MANOVA) statistics (Wilks' Lambda, Pillai's Trace, Hotelling-Lawley Trace, and Roy's Greatest Root). Table 30 shows the results of multivariate regression analysis for eight independent variables of knowledge management capabilities and four dependent variables of organizational performance.

The overall proportion of variance in four aspects of organizational performance accounted for by the combination of eight knowledge management capabilities was statistically significant when α was 0.01. Thus, the eight independent variables could explain the four dependent variables after the relationship of the dependent variables was taken into account.

Table 30

The Summary of Model Fit Index of Multivariate Analysis

Distribution	Num DF	Den DF	F-Value
Wilks' Lambda	32	399.88	9.71**
Pillai's Trace	32	444	5.33**
Hotelling-Lawley Trace	32	271.95	18.58**
Roy's Greatest Root	8	111	73.06**

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2- tailed).

To test the hypothesis that there was a relationship between each of eight knowledge management variables and each of four aspects of organizational performance, multiple regression analysis was implemented.

The customer-related aspect of organizational performance is explained by knowledge management capabilities ($R^2 = .593$). Among the eight knowledge management capabilities, application and protection are statistically significant to explain the customer-related aspect (Table 31).

Table 31

The Multiple Regression Result for the Customer-related Variable of Organizational Performance

Dependent variables	Explanatory variables	Coefficient	t-value
Customer-Related Aspect (R^2 = .593**)	Technology	.007	.08
	Structure	-.160	-1.32
	Culture	.128	1.12
	Incentive	.041	.66
	Acquisition	-.021	-.20
	Conversion	.267	1.90
	Application	.315	2.81**
	Protection	.157	2.32*

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

The application was associated with a .315 unit change ($t = 2.81$, $p < 0.01$) in the customer-related organizational performance. The hypothesis (H_A2-b-25), 'there is no significant relationship between application and customer-related organizational performance,' was rejected when the significant level was 0.01. Also, protection was associated with a .157 unit change ($t = 2.32$, $p < 0.05$) in the customer-related organizational performance. The hypothesis (H_A2-b-29), 'there is no significant relationship between protection and customer-related organizational performance,' was rejected when the significant level was 0.05.

However, the high correlation between independent variables can devastate the effects on regression statistics (Motulsky, n.d.). Table 28 indicates that the eight knowledge management capabilities are highly correlated with each other. In the multiple regression analysis, if the specific variables are enough to explain the dependent variable, other variables could be shown as not statistically significant, because one major purpose of the multiple regression analysis is to simplify the model by highlighting the most explainable variables, which have the biggest r-squared (R^2), the percentage of how much independent variables could explain the dependent

variable (Upton & Cook, 2008; Vogt, 2005). For example, if all independent and dependent variables are correlated, the multiple regression analysis highlights the most explainable variables and leaves other independent variables as not statistically significant. In general, there are two reasons. First, it is possible that the concepts between two variables are similar, and that they carry the same meaning; second, it is also possible that independent variables are simply correlated to each other either naturally or peculiarly. For example, a person who is good at math might also be good at physics, but math and physics are different concepts even though they are highly correlated. In this case, it is recommended to check the content of the survey items and the result of the discriminant validity test, depending on the researcher's decision. According to the instrument of this study, the survey items actually carried different concepts, and also passed the discriminant validity test. Therefore, in this study, knowledge management capabilities are intimately correlated with each other.

To see the impact of other variables which were not statistically significant in the multiple regression analysis, the analysis was re-conducted without statistically significant variables. A finding that the R^2 was statistically significant to the dependent variable could indicate that the other independent variables still have decent explanation toward the dependent variable. This process was repeated until the R^2 of remaining independent variables was not statistically significant.

To see the effects of other knowledge management capabilities (except application and protection), a supplementary multiple regression analysis was conducted. Table 32 shows the results.

Table 32

The Supplementary Multiple Regression Analysis of the Customer-related Variable of Organizational Performance

R^2	Explanatory variables	Coefficient	t-value
The 2nd multiple regression analysis			
.535**	Technology	.100	1.137
	Structure	-.226	-1.773
	Culture	.295	2.664**
	Incentive	.002	.025
	Acquisition	-.067	-.594
	Conversion	.569	4.659**
The 3rd multiple regression analysis			
.381**	Technology	.232	2.392*
	Structure	.035	.261
	Incentive	.067	.994
	Acquisition	.331	3.112**
The 4th multiple regression analysis			
.261**	Structure	.417	3.665**
	Incentive	.193	2.894**

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

The supplementary multiple regression analysis shows that all R^2 of alternative multiple regression analysis are statistical significant when α is 0.01. Therefore, this analysis supports the finding that all knowledge management capabilities are positively correlated with the customer-related aspect of organizational performance.

The internal business process aspect of organizational performance is well explained by knowledge management capabilities ($R^2 = .705$). Among eight knowledge management capabilities, only two variables, culture and protection, are statistically significant to explain the internal business process aspect. Table 33 shows the results.

Table 33

The Multiple Regression Result for the Internal Business Process Variable of Organizational Performance

Dependent variables	Explanatory variables	Coefficient	t-value
Internal Business Process Aspect (R^2 = .705**)	Technology	.044	.66
	Structure	-.023	-.24
	Culture	.204	2.31*
	Incentive	-.002	-.05
	Acquisition	.101	1.22
	Conversion	.117	1.09
	Application	.152	1.76
	Protection	.219	4.21**

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

Culture was associated with a .204 unit change ($t = 2.31$, $p < 0.05$) in the internal business process organizational performance. The hypothesis (H_A2-b-10), 'there is no significant relationship between culture and internal business process organizational performance,' was rejected when the significant level was 0.05. Also, protection was associated with a .219 unit change ($t = 4.21$, $p < 0.01$) in the in the internal business process organizational performance. The hypothesis (H_A2-b-30), 'there is no significant relationship between protection and internal business process organizational performance,' was rejected when the significant level was 0.01.

A supplementary multiple regression analysis was also conducted for the internal business process aspect of organizational performance. Table 34 shows the results.

Table 34

The Supplementary Multiple Regression Analysis of the Internal Business Process Variable of Organizational Performance.

R^2	Explanatory variables	Coefficient	t-value
The 2nd multiple regression analysis			
.641**	Technology	.122	1.740
	Structure	.015	.161
	Incentive	-.018	-.349
	Acquisition	.159	1.823
	Conversion	.191	1.651
	Application	.297	3.514**
The 3rd multiple regression analysis			
.601**	Technology	.178	2.482*
	Structure	.032	.324
	Incentive	-.070	-1.35
	Acquisition	.151	1.652
	Conversion	.430	4.375**
The 4th multiple regression analysis			
.494**	Structure	.273	2.777**
	Incentive	.046	.873
	Acquisition	.449	5.477**
The 5th multiple regression analysis			
.188**	Incentive	.289	5.226**

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

The alternative multiple regression analysis shows that all R^2 of the alternative multiple regression analysis are statistical significant when α is 0.01. Therefore, this analysis supports the finding that all knowledge management capabilities are positively correlated with the internal business process aspect of organizational performance.

The learning & growth aspect of organizational performance is well explained by knowledge management capabilities ($R^2 = .675$). Among eight knowledge management

capabilities, only two variables, culture and conversion, were statistically significant to explain the learning & growth aspect. The results are shown in Table 35.

Table 35

The Multiple Regression Result for the Learning & Growth Variable of Organizational Performance.

Dependent variables	Explanatory variables	Coefficient	t-value
Learning & Growth Aspect ($R^2 = .675$)	Technology	-.018	-.22
	Structure	.059	.49
	Culture	.436	3.89**
	Incentive	.061	1.01
	Acquisition	-.013	-.12
	Conversion	.386	2.82**
	Application	.044	.40
	Protection	.055	.82

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

Culture was associated with a .436 unit change ($t = 3.89$, $p < 0.01$) in the learning & growth of organizational performance. The hypothesis (H_A2-b-11), 'there is no significant relationship between culture and learning & growth in organizational performance,' was rejected when the significance level was 0.01. Conversion was associated with a .386 unit change ($t = 2.82$, $p < 0.01$) in the learning & growth of organizational performance. The hypothesis (H_A2-b-23), 'there is no significant relationship between conversion and learning & growth organizational performance,' was rejected when the significance level was 0.01.

The supplementary multiple regression analysis also conducted for the learning & growth aspect of organizational performance. Table 36 shows the results.

Table 36

The Supplementary Multiple Regression Analysis of the Learning & Growth Variable of Organizational Performance.

R^2	Explanatory variables	Coefficient	t-value
The 2nd multiple regression analysis			
.610**	Technology	-.002	-.017
	Structure	.263	2.207*
	Incentive	.092	1.554
	Acquisition	.216	2.181*
	Application	.353	3.822**
	Protection	.101	1.433
The 3rd multiple regression analysis			
.464**	Technology	.305	3.465**
	Incentive	.146	2.206*
	Protection	.264	3.554**

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

The alternative multiple regression analysis shows that all R^2 of alternative multiple regression analysis are statistically significant when α is 0.01. Therefore, this analysis supports that all knowledge management capabilities are positively correlated with the learning & growth aspect of organizational performance.

The perceptual financial variable of organizational performance is well explained by knowledge management capabilities ($R^2 = .648$). Among the eight knowledge management capabilities, only two variables, incentive and conversion, are statistically significant to explain the perceptual financial aspect. Table 37 shows the results.

Table 37

The Multiple Regression Results of the Influence of Knowledge Management Variables on the Perceptual Financial Variable of Organizational Performance.

Dependent variables	Explanatory variables	Coefficient	t-value
Perceptual Financial Variable (R^2 = .648)	Technology	-.021	-.23
	Structure	-.079	-.60
	Culture	.157	1.25
	Incentive	.144	2.13*
	Acquisition	.180	1.53
	Conversion	.386	2.52*
	Application	.234	1.91
	Protection	.001	.01

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

Incentive was associated with a .436 unit change (t = 2.13, p < 0.05) in the perceptual financial organizational performance. The hypothesis (HA2-b-16), 'there is no significant relationship between incentive and perceptual financial organizational performance,' was rejected when the significance level was 0.05. Also, conversion was associated with a .386 unit change (t = 2.52, p < 0.05) in the perceptual financial organizational performance. The hypothesis (HA2-b-24), 'there is no significant relationship between conversion and perceptual financial organizational performance,' was rejected when the significance level was 0.05.

The supplementary multiple regression analysis was also conducted for the learning & growth aspect of organizational performance. Table 38 shows the results.

Table 38

The Supplementary Multiple Regression Analysis of the Perceptual Financial Variable of Organizational Performance.

R^2	Explanatory variables	Coefficient	t-value
The 2nd multiple regression analysis			
.591**	Technology	.055	.562
	Structure	.047	.341
	Culture	.071	.533
	Acquisition	.396	3.585**
	Application	.390	3.449**
	Protection	.056	.726
The 3rd multiple regression analysis			
.490**	Technology	.188	1.800
	Structure	.136	.903
	Culture	.430	3.476**
	Protection	.182	2.243*
The 4th multiple regression analysis			
.389**	Technology	.405	4.068**
	Structure	.407	2.779**

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

The alternative multiple regression analysis shows that all R^2 of the alternative multiple regression analysis were statistically significant when α is 0.01. Therefore, this analysis supports the conclusion that all knowledge management capabilities are positively correlated with the learning & growth aspect of organizational performance.

1. What is the impact of Knowledge Management Capabilities on organizational performance in the South Korean business environment?

    1-c. How do the eight variables of knowledge management capabilities relate to the objective financial organizational performance in the South Korean business environment?

Because there is a tacit agreement that one subjective or objective financial indicator is not enough to evaluate organizational performance, it is better to use more than one indicator to

supplement each other (Torenvlied & Akkerman, 2009). Tobin's *q* was calculated as the objective financial aspect of organizational performance. In this study, a total of 120 organizations participated among the KOSPI 200, and their mean score of Tobin's *q* was 1.202 (*SD* = .531, Max = 3.631, Min = .046).

The Tobin's q financial variable of organizational performance may not be well explained by knowledge management capabilities (R^2 = .145).

Table 39

The Multiple Regression Results for the Tobin's q Financial Variable of Organizational Performance.

Dependent variables	Explanatory variables	Coefficient	t-value
Tobin's *q* Financial Variable (R^2 = .145)	Technology	-.128	-1.068
	Structure	-.177	-1.050
	Culture	.088	.549
	Incentive	-.092	-1.073
	Acquisition	.192	1.275
	Conversion	-.089	-.454
	Application	-.178	-1.143
	Protection	.049	.523

Note. * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

None of the independent knowledge management variables (technology, structure, culture, incentive, acquisition, conversion, application, and protection) were statistically significant. Table 39 shows the multiple regression result between eight knowledge management capabilities variables and Tobin's *q*.

2. What is the internal relationship among the eight different knowledge management capabilities aspects?

This research question identified the internal relationship within the eight knowledge management capabilities variables. For this question, the Pearson correlation coefficient was

calculated for every combination of knowledge management capabilities (Table 28). The correlation coefficient is a number that summarizes the direction and magnitude of linear relations between two variables (Glass & Hopkins, 1996). It usually helps to compare the closeness and direction of association between different pairs of variables. For this reason, the Pearson correlation coefficient was the most suitable statistical analysis for this question.

Significant relationships were apparent among every combination of knowledge management capabilities variables, when α is 0.05. Table 28 shows the matrix of the correlation coefficient of each pair of eight knowledge management capabilities. Very high correlation coefficients were identified between conversion and application (.801), acquisition and conversion (.788), and culture and application (.755). However, there was relatively little correlation between culture and incentive (.355), and incentive and application (.393). But they both were significant when α is 0.01.

3. Do differences in practicing knowledge management exist between the upper 100 companies in the KOSPI 200 and the lower 100 companies in the KOSPI 200 organizations?

Traditionally, the South Korean economy has been highly focused on a few large enterprises. According to *Labor Today* (2008), the total assets of eight major South Korean corporations accounted for 53.22% of the entire South Korean GDP. The top four corporations accounted for 43.45% of the South Korean GDP. This phenomenon has been similarly observed within the KOSPI 200 organizations. The top 100 KOSPI 200 organizations occupied 96.4% of the total market value, a value of $443.4 million U.S., whereas the lower 100 KOSPI 200 organizations occupied 3.6% of the total market, or $16.7 million U.S. In the sample, 78 organizations belonged in the top 100 organizations, accounting for 86.7% of the total market value, equivalent to $339.6 million U.S. On the other hand, 42 organizations belonged to the

lower 100 organizations, making up only 1.8% of the total market value, equivalent to $8.3 million U.S.

Prior to *t*-tests, the differences of variables were compared. The equality of variances test assesses the hypothesis that two variances are equal (Glass & Hopkins, 1996). When the test results confirm the equality of variances, two variables are assumed to have an identical variance. On the other hand, if the quality of variance is not supported, two variables are assumed to have distinct variances.

The results show that the mean score differences between the upper 100 and lower 100 organizations were statistically significant ($\alpha = 0.05$) in all knowledge management capabilities variables, except acquisition. The top 100 KOSPI 200 organizations have higher mean scores than the lower 100 KOSPI 200 organizations. Significant mean differences in protection (.515) and technology (.434) were observed. However, acquisition knowledge process capability was not statistically significant ($t = 1.873$). The results are shown in Table 40.

Table 40

A Comparison of Means between the Upper and Lower 100 KOSPI 200 Organizations for Knowledge Management Capabilities.

Independent variables	Org.	Mean	*SD*	Std. error mean	Mean difference	*df*	*t*
Technology	Top 100	4.134	.623	.071	.434	118	3.684**
	Low 100	3.701	.599	.092			
Structure	Top 100	3.892	.612	.069	.225	118	2.030**
	Low 100	3.667	.512	.079			
Culture	Top 100	4.349	.523	.059	.281	118	2.870**
	Low 100	4.067	.492	.076			
Incentive	Top 100	3.219	.707	.080	.290	118	2.050*
	Low 100	2.929	.796	.123			
Acquisition	Top 100	3.837	.516	.058	.192	118	1.873
	Low 100	3.645	.568	.088			
Conversion	Top 100	3.927	.546	.062	.348	118	3.266**
	Low 100	3.579	.576	.089			
Application	Top 100	4.428	.559	.063	.389	118	3.607**
	Low 100	4.038	.573	.088			
Protection	Top 100	4.587	.664	.075	.515	118	4.107**
	Low 100	4.072	.638	.098			

Note. Upper 100 (n = 78) & Lower 100 organizations (n = 42). * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

In organizational performance, the customer-related (t = 3.214*) and the internal business (t = 3.053*) aspects highlighted that the mean score differences between the upper and lower 100 organizations were statistically significant (Table 40). However, the learning & growth and the perceptual financial aspects were not statistically significant.

Table 41

A Comparison of the Means between the Upper and Lower 100 KOSPI 200 Organizations for Organizational Performance.

Dependent variables	Org.	Mean	*SD*	Std. error mean	Mean difference	*df*	*t*
Customer-Related	Top 100	4.379	.495	.056	.328	118	3.214*
	Low 100	4.052	.597	.092			
Internal Business	Top 100	4.620	.507	.057	.282	118	3.053*
	Low 100	4.339	.431	.066			
Learning & Growth	Top 100	4.272	.600	.068	.320	118	2.851
	Low 100	3.952	.563	.087			
Financial	Top 100	4.008	.628	.071	.313	118	2.572
	Low 100	3.695	.652	.101			

Note. Upper 100 (n=78) & Lower 100 organizations (n=42). * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

4. Do differences exist between manufacturing and non-manufacturing organizations in the KOSPI 200?

The participating firms consisted of 81 manufacturing and 39 nonmanufacturing organizations. The results showed that knowledge management capabilities were statistically significant between manufacturing and nonmanufacturing organizations when α is .05.

According to the t-test results, there were no mean differences between manufacturing and nonmanufacturing organizations within the KOSPI 200 when α was .05.

Table 42

A Comparison of Means between Manufacturing and Nonmanufacturing KOSPI 200 Organizations for Knowledge Management Capabilities.

Independent Variables	Org.	Mean	Std. deviation	Std. error mean	Mean difference	*df*	*t*
Technology	Manu.	3.910	.631	.070	-.224	118	-1.797
	Non-Manu.	4.134	.661	.106			
Structure	Manu.	3.584	.396	.044	-.056	59.758	-.595
	Non-Manu	3.640	.522	.084			
Culture	Manu.	4.197	.499	.055	-.163	118	-1.596
	Non-Manu	4.360	.574	.092			
Incentive	Manu.	3.072	.766	.085	-.141	118	-.966
	Non-Manu	3.213	.713	.114			
Acquisition	Manu.	3.720	.545	.061	-.154	118	-1.472
	Non-Manu	3.874	.521	.083			
Conversion	Manu.	3.764	.586	.065	-.127	118	-1.129
	Non-Manu	3.891	.561	.090			
Application	Manu.	4.257	.581	.065	-.106	118	-.917
	Non-Manu	4.363	.615	.098			
Protection	Manu.	4.381	.697	.077	-.078	118	-.571
	Non-Manu	4.459	.704	.113			

Note. Manufacturing organizations (n = 81) & Nonmanufacturing organizations (n = 39). * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

The mean score differences between manufacturing and nonmanufacturing organizations within the KOSPI 200 were not statistically significant ($\alpha = 0.05$) in any aspect of organizational performance.

Table 43

A Comparison of Means between Manufacturing and Nonmanufacturing of KOSPI 200 Organizations for Organizational Performance.

Dependent variables	Org.	Mean	Std. deviation	std. error mean	Mean difference	*df*	*t*
Customer-Related	Manu.	4.242	.544	.060	-.069	118	-.640
	Non-Manu.	4.311	.577	.092			
Internal Business	Manu.	4.492	.443	.049	-.092	58.581	-.854
	Non-Manu	4.584	.600	.096			
Learning & Growth	Manu.	4.118	.557	.062	-.130	62.462	-1.024
	Non-Manu	4.248	.693	.111			
Perceptual Financial	Manu.	3.865	.651	.072	-.102	118	-.801
	Non-Manu	3.967	.655	.105			

Note. Manufacturing organizations (n = 81) & Nonmanufacturing organizations (n = 39). * is significant at the 0.05 level (2-tailed). ** is significant at the 0.01 level (2-tailed).

Summary

This chapter presented the results of the data analysis for the study and consisted of five parts. The first part included an exploratory factor analysis used to reduce numbers of survey items for better response rate, as well as to determine whether certain questions can be used to measure latent variables. The second part included a confirmatory factor analysis to assess the three confirmatory measurement models (knowledge infrastructure capability, knowledge process capability, and organizational performance). Reliability, construct validity, and the overall model fit were primarily examined. In the third part, the conceptual model of knowledge management capabilities and organizational performance was developed, and the relationships among the three major constructs were examined. However, the conceptual model had an inappropriate model fit due to multicollinearity, and therefore, the alternative model was

proposed based on theoretical and empirical foundations, which combined knowledge infrastructure capability and knowledge process capability in the higher ranking latent variable, knowledge management capabilities. In the fourth part, more detailed relationships were examined. The interrelationships within knowledge management capabilities and individual relationships between knowledge management capabilities and the four aspects of organizational performance were identified. In the fifth part, mean differences between the upper and lower 100 KOSPI 200 organizations and between manufacturing and nonmanufacturing organizations were compared.

Chapter 5

Discussion and Conclusion

Knowledge is one of the most valuable assets in enabling faster response to changes in the business environment. Organizations have considerable motivation to manage their knowledge asset effectively and to use this asset as the basis for competitive advantage. However, many organizations may lack the appropriate policies for effective knowledge management (Tapscott, 2003; Walker, 2006). Hsu (2008) asserted that knowledge is not symmetrically distributed within an organization, and that it is crucial to develop a competitive advantage by identifying, capturing, sharing, and accumulating knowledge. An organization must have knowledge management capabilities to be flexible and respond more quickly to fast changing market conditions and to innovate itself by improving decision making and productivity. However, the link between knowledge management capabilities and organizational performance is still too weak to make strategic decisions and satisfy its investors (Carrillo et al., 2003; Gold et al., 2001; Martin, 2003). This study investigated the relationship between knowledge management capabilities and organizational performance. Knowledge management capabilities were specified as knowledge infrastructure and knowledge process capabilities, and organizational performance adopted the concept of the Balanced Scorecard which attempts to measure organizational performance in four aspects: financial, customer-related, internal business process, and learning & growth. By specifying knowledge management capabilities and organizational performance, this study explored specific detailed relationships, and identified developing knowledge management practices.

Chapter 5 includes six sections that discuss the empirical findings of Chapter 4. They are: (a) summary of the study, (b) summary of findings and discussions, (c) contributions to new

knowledge in HRD, (d) limitations of the study, (e) recommendations for future research, and (f) conclusion.

Summary of the Study

The foundation for the present study was Gold's (2001) knowledge management capabilities framework, which integrated the fragmented literature of knowledge management into a holistic view and developed a framework (Figure 1). However, there are a number of major modifications.

First, Gold (2001) mentioned that the knowledge management capabilities consist of knowledge infrastructure capability and knowledge process capability. The knowledge infrastructure capability includes technology, structure, and culture, whereas, the knowledge process capability includes acquisition, conversion, application, and protection. However, he did not provide a thorough explanation of the effect of incentives on the knowledge management processes, which could motivate and encourage knowledge management processes. In general, converting knowledge into a shareable format involves cost, effort, and time. Potential knowledge providers are often unwilling to share knowledge unless they are rewarded for doing so (Evaristo, 2005; Suresh & Mahesh, 2006). Employees often need incentives to participate in the knowledge-sharing process. In this study, the modified framework that includes incentives in the knowledge infrastructure capability was empirically tested in the South Korean business context (Figure 2).

Second, the original instrument included questionnaires about knowledge infrastructure capability, knowledge process capability, and organizational effectiveness. However, in the present study, the items of organizational effectiveness were excluded, and the four aspects of

the Balanced Scorecard were adopted, which includes financial, customer-related, internal business process, and learning & growth. In previous studies, Gold (2001) and Smith (2006b) attempted to identify the relationship between knowledge management capabilities and organizational effectiveness, not the direct effect on organizational performance. They defined organizational effectiveness as the ability to innovate, improve coordination of efforts, promote rapid commercialization of new products, anticipate surprises, respond to market change, and reduce redundancy of information/knowledge. Their studies presumed that organizational effectiveness could improve organizational performance, but did not empirically test that assumption, because they believed that organizational performance is affected by many factors, both inside and outside the firm. From a limited point of view, uncontrollable factors, such as economic changes, cannot be accounted for; therefore, many researchers fail to identify the direct relationship between knowledge management and organizational performance (Hsu, 2008; Martin, 2003). However, this opinion could only be true when organizational performance is measured in the limited view, such as measuring only financial performance. Therefore, this study adopted the concept of the Balanced Scorecard as the organizational performance measurement, which measures organizational performance in pluralistic aspects, namely, customer-related, internal business process, learning & growth, as well as financial aspects. The Balanced Scorecard is a measurement tool that takes into account financial and nonfinancial indicators, internal and external constituents of the organization, and lagging and leading indicators (Niven, 2002).

Third, the original and previous studies selected senior managers in the organization, at the level of vice-president or above, as key informants to describe the structural elements of the organization and the knowledge-oriented processes. However, in this study, South Korean

middle managers were selected as the key informants, because they interact with top management, work with the bottom line, and are autonomous to lead a project team or department. South Korean middle managers were defined as persons who usually work at four levels: *Dae-ri*(대리), *Bu-jang* (부장), *Cha-jang* (차장), and *Gwa-jang* (과장).

The target population of this study was the Korea Composite Stock Price Index (KOSPI) 200 organizations in South Korea, which are leading organizations of industry in that country. The list of KOSPI 200 organizations was based on December 30, 2009, the last day of stock trading in South Korea for 2009. A convenience sampling procedure was used to collect information from middle managers of the KOSPI 200 organizations. Because organizational level data was required for this study, several individual responses from each KOPSI 200 organization were averaged into one organizational level response.

Basically, this study had two steps of recruitment process. In the first step, since the researcher had to figure out which KOSPI 200 organizations allowed their middle managers to participate in the study, the researcher contacted all KOSPI 200 organizations based on contact information obtained primarily from each company's website and phone directory to identify which KOSPI 200 organizations would participate in the study. Most contacts were made by sending emails or calling to their representative phone numbers. Among 200 KOSPI organizations, 161 agreed to participate, and 39 organizations did not respond to the researcher's request or declined to participate in the study. If organizations refused to participate to the study, there was no additional request to participate in the study. However, if organizations did not respond, the researcher sent two additional emails or called them twice more. In the end, 34 organizations did not respond, whereas 5 organizations refused to participate.

The second step of recruitment process was the actual data collection process. To obtain a sample of middle managers at 161 KOSPI 200 organizations, contact information was obtained primarily from each company's website, phone directory, and walk-in visits. Once the contact information was collected, the researcher sent invitation emails, which included the brief introduction of the study and the survey URL, to participating middle managers of 161 KOSPI 200 organizations. However, the data collection process did not occur in all KOSPI 200 organizations at once, but data were mostly obtained from organizations one by one.

During the first stage of the data collection, the researcher found that many participants requested compensation for completing the survey, because the survey was long enough to interrupt their workday and they were accustomed to receiving compensation for filling out surveys. Therefore, after the researcher collected the surveys from 24 middle managers from 9 organizations, two movie tickets were offered to those workers who completed the survey. Additionally, some organizations were very sensitive to distributing the survey. Therefore, the researcher had a contact person from within each organization to distribute the survey. Thereafter, 18 organizations were contacted, but only 33 middle managers from 14 organizations completed the survey. A total of 730 invitations were sent to middle managers from 161 participating organizations. From those organizations, 330 middle managers from 120 KOSPI 200 organizations successfully completed the survey for further analysis, yielding a 45.2% response rate.

The list of KOSPI 200 on December 30, 2009 consisted of 142 manufacturing organizations (71%) and 58 nonmanufacturing organizations (29%). In this study, the 120 sample organizations consisted of 81 manufacturing (67.5%) and 39 (32.5%) nonmanufacturing (Table 21). Participants' job positions and departments varied, depending on their organizations

and job responsibilities. As shown in Table 22, of these, 174 were managers (52.7%) and 73 were deputy general managers (22.1%) from finance & accounting (20.3%), human resources (16.1%), general management (13.9%), marketing & sales (13.0%), strategic & innovation (12.1%), and R&D (7.9%).

Summary of Findings and Discussion

To answer the main objective of this study, identifying the relationship between knowledge management capabilities and organizational performance, the research questions of this study were focused on identifying the relationship between two types of knowledge management capabilities, namely, knowledge infrastructure and knowledge process capabilities, and organizational performance.

Validating the knowledge management capabilities and organizational performance instrument.

There are five reasons to validate the knowledge management capabilities and organizational performance instrument. First, it is difficult to identify accurately the relationships between knowledge management capabilities and organizational performance without any validated instruments. Since knowledge management is an emerging field in the current business environment, there are few validated instruments related to knowledge management capabilities. Second, the original instrument did not include the aspect of incentives, which is considered to be the most influential motivator of knowledge sharing. However, it was unknown whether the aspect of incentives was actually a part of the knowledge infrastructure capability. Third, the original instrument was written in English, and it was necessary to translate it into Korean. However, translating into another language often creates nuances in meaning which could affect

the reliability and validity of the research. For reducing the nuances, this study adopted the back translation procedure, “the process of translating the translated target language version back to the source language by a bilingual person” (Kim & Lim, 1999, p. 6). Nonetheless, the back translation procedure does not guarantee the reliability and validity of the instrument completely, so it was necessary to validate it. Fourth, the original instrument included the concept of organizational effectiveness, but this study adopted the concept of the Balanced Scorecard, which includes financial, customer-related, internal business process, and learning & growth aspects of organizational performance, because it is more frequently used in contemporary business, and covers both lagging and leading performance indicators (Kaplan & Norton, 1992). Lagging indicators are those that focus on results at the end of a time period, such as financial performance, whereas, leading indicators are measures that drive or lead to the performance of lagging indicators, such as customer-related, internal business process, and learning & growth aspects of organizational performance (Niven, 2006). The organizational performance instrument of the Balanced Scorecard was adopted from Blackmon's (2008) study and created by the researcher according to Niven's (2006) book. However, its validity and reliability were unknown. Lastly, the original instrument included 134 items, which were too many to elicit a sufficient response rate. For the pilot study, the major participants were clients of one major HR consulting firm in South Korea. However, the consulting firm was very sensitive to sharing its customer information, so the researcher had to ask the firm to distribute the invitation to its clients. The exact response rate for the pilot study is unknown, but many participants of the pilot study complained about the survey length, saying that it took more than an hour to complete. Often, middle managers of the KOSPI 200 organizations suffer from a barrage of research requests, and they are reluctant to complete the survey if it is too long or complex. Therefore, the original

survey length was reduced to 76 items through the pilot study. In general, if there is any change to the instrument, it is recommended to recheck its validity and reliability.

This study found that the instrument used for measuring knowledge infrastructure capability, knowledge process capability, and organizational performance showed affordable model fits (Table 23), which confirmed that there are four factors of knowledge infrastructure capability (i.e., technology, structure, culture, and incentive), four factors of knowledge process capability (i.e., acquisition, conversion application, and protection), and four factors of organizational performance (customer-related, internal business process, learning & growth, and perceptual financial aspects). Also, factor loadings (λ) of all items were loaded more than .50 to their associated factors, which indicated that items were significantly loaded on their respective latent factors (Bagozzi & Yi, 1988) (Tables 24, 25, and 26). Moreover, all AVE scores were more than .50, which indicated that the variance explained by the construct was greater than the measurement error. Therefore, it was reasonable to conclude that the instrument used for this study had adequate convergent validity. Additionally, the discriminant validity test which tested all possible combinations of factors was significantly different. If the combination was not significantly different, it could be inferred that two factors covered the same concept. This study showed that all combination of factors was statistically significant (Table 27), which indicated that the instrument used for this study showed discriminant validity.

This study made significant contributions to the field of knowledge management through its main inquiry of identifying the relationship between knowledge management capabilities and organizational performance. The instrument for knowledge management capabilities and organizational performance based on the Balanced Scorecard was validated through the empirical analysis, which could provide the guideline with theoretical background and the

validated instrument for follow-up studies. However, to make a stable and rigid instrument for knowledge management capabilities and organizational performance, follow-up studies are required to reconfirm the results of this study.

The overall relationships between knowledge management capabilities and organizational performance.

The main inquiry of the study was to identify the relationship between knowledge management capabilities, which include knowledge infrastructure and knowledge process capabilities, and organizational performance in the South Korean business context. Knowledge infrastructure capability includes four sub-constructs of technology, structure, culture, and incentive, whereas the knowledge process capability variable includes acquisition, conversion, application, and protection variables. Organizational performance was investigated based on the concept of the Balanced Scorecard developed by Kaplan and Norton (1992), which includes four aspects of organizational performance: customer-related, internal business process, learning & growth, and financial aspects. The main purpose of this inquiry is to determine whether an organization's investments in knowledge management pay off through organizational performance. Linking knowledge management to organizational performance makes a strong case for adopting and funding knowledge management and demonstrating its benefits (Carrillo, Robinson, Anumba, & Al-Ghassani, 2003).

At the start of this study, the researcher conceptualized the framework of knowledge management capabilities and organizational performance (Figure 3), and attempted to identify the overall structural relationships. The results showed a positive relationship ($\gamma = 1.12$, $t =$ 6.826**) between knowledge process capability and organizational performance variables. However, there was a negative relationship ($\gamma = -.14$, $t = -.462$) between knowledge

infrastructure capability and organizational performance, and it was not statistically significant when $\alpha = 0.05$ (Figure 8). The overall fit of the conceptual model was insufficient to support the framework. The main reason for the negative relationship between knowledge infrastructure capability and organizational performance, and the insufficient model fits might be due to a high correlation between knowledge infrastructure and knowledge process capabilities (.951). In the regression study where there were more than two independent variables, the high correlation between independent variables could have had devastating effects on regression statistics to the extent of rendering them misleading and useless (Pedhazur, 1997). In this analysis, the estimate of correlation between knowledge infrastructure and knowledge process capabilities was .951, which could imply that the statistical result could be contaminated. There are two possible explanations for this phenomenon. First, it is possible that the concepts between two variables are so similar that they carry the same meaning, and, second, it is also possible that they are just simply correlated (W. J. Jang, personal communication, October 14, 2010). For example, a person who is good at math might also be good at physics, but math and physics are different concepts even though they are highly correlated.

This study found that Knowledge Infrastructure Capability (KIC) and Knowledge Process Capability (KPC) are different concepts for two reasons. First, this study ran two alternative Structural Equation Modeling (SEM) analyses. The first alternative SEM model assumed that KIC and KPC were the same concept, and combined them into one high-order latent variable, Knowledge Management Capabilities (Figure 9), and the second alternative SEM model assumed that KIC and KPC were different concepts, and put them under the higher-order latent variable, KPC (Figure 10). The SEM results showed that the second alternative model fit was better than the first one, leading to the conclusion that KIC and KPC are different concepts, but

highly correlated (Table 29). Second, Dr. Jang, a statistics professor (personal communication, October 22, 2010), mentioned that the best way to choose the explanation related to high correlation is to check and compare survey items from both variables. If the items address a similar concept, one may conclude that both variables carry the same concept; otherwise, if the items address different concepts, one may consider that they are different concepts. According to the instrument (Tables 17 and 18), the survey items addressed different concepts. Moreover, the eight knowledge management capabilities also passed the discriminant validity test. Therefore, the researcher concluded that knowledge infrastructure and knowledge process capabilities are intimately and positively correlated with each other.

This study initially attempted to find the best suited model to explain the relationship between knowledge management capabilities and organizational performance, and concluded that the second alternative model would be the best to explain the relationship (Figure 10). In this study, there was a positive relationship (.998) between knowledge management capabilities and organizational performance in the KOSPI 200 organizations. Within the KOSPI 200, when an organization has more knowledge management capabilities, it improves its organizational performance with regard to the four aspects of the Balanced Scorecard. The more an organization invests in its knowledge management initiatives, the greater the likelihood that it increases the positive relationships with its customers, improves it internal business processes, facilitates learning and innovation, and convinces its employees to feel better about their financial performance. In many cases, knowledge management itself has not been spotlighted as an important contributor in improving organizational performance, because there are few empirical studies to support the relationship (Carrillo et al., 2003; Gold et al., 2001; Martin, 2003). Moreover, many knowledge management related studies were only focused on the limited

and fragmented knowledge management aspect, such as only investigating the relationship between the information technology aspect of knowledge management and organizational performance. However, in order to make knowledge management more effective, it is important to identify all possible cultural aspects, tools, contexts, infrastructures, or processes that influence it (Chou & He, 2004). The overall relationship between knowledge management capabilities and organizational performance is important because they are multifaceted concepts including various theoretical fields and practices (Carrillo et al., 2003; Gold et al., 2001; Iftikhar, 2003; Martin, 2003). Prior to identifying the specific and fragmented relationship between knowledge management capabilities and organizational performance, it is important to see the big picture, i.e., the important elements and the overall relationship between knowledge management capabilities and organizational performance. In this context, this study measured knowledge management capabilities and organizational performance in the pluralistic viewpoint, and found that they were positively correlated in the KOSPI 200 organizations. It is critical that organizations determine whether the investment in a knowledge management system pays off in terms of demonstrable performance improvement (Iftikhar, 2003). This provides strong evidence in convincing organizations that plan to adopt and invest in knowledge management, particularly when knowledge management initiatives are competing with other business initiatives for resources and funding.

The individual relationship between knowledge management capabilities and organizational performance.

This study also identified individual relationships between the eight variables of knowledge management capabilities and the four aspects of organizational performance. For the analyses, knowledge management capabilities (i.e., technology, structure, culture, incentive,

acquisition, conversion, application, and protection) were the independent variables, while the four aspects organizational performance (i.e., financial, customer-related, internal business process, and learning & growth) were the dependent variables.

However, not every relationship between the eight variables of knowledge management capabilities and the four aspects of organizational performance was statistically significant in the multiple regression analysis. Table 44 shows the summary of the multiple regression analysis results.

Table 44

Summary of the Multiple Regression Analysis for the Relationship of the Independent Variables of Knowledge Management Capabilities to the Dependent Variables of Organizational Performance.

Dependent variables	Independent variables (coefficient)
The customer-related aspect	Application (2.81**) & Protection (2.32*)
The internal business process aspect	Culture (2.31*) & Protection (4.21**)
The learning & growth aspect	Culture (3.89**) & Conversion (2.82**)
The perceptual financial aspect	Incentive (2.13*) & Conversion (2.52*)

Note. ** is significant at the 0.01 level (2-tailed); * is significant at the 0.05 level (2-tailed).

In the multiple regression analysis, if the specific variables are sufficient to explain the dependent variable, other variables could be shown as not statistically significant, because one major purpose of the multiple regression analysis is to simplify the model by highlighting the most explainable variables, which have the biggest r-squared (R^2), the percentage of how much independent variables could explain the dependent variable (Upton & Cook, 2008; Vogt, 2005). For example, if all independent variables are correlated with the dependent variable, the multiple regression analysis highlights the most explainable variables, and leaves other independent variables as not statistically significant. Therefore, the researcher conducted the supplementary multiple regression analysis to investigate the impact of other knowledge management

capabilities on the four aspects of organizational performance, and found that all knowledge management capabilities could explain the four aspects of organizational performance (Tables 32; 34; 36; 38). This indicates that no aspect of knowledge management capabilities should be overlooked. Also, the correlation matrix supported the finding that all knowledge management capabilities were statistically correlated with the four aspects of organizational performance (Table 28).

This finding indicated the most critical, but easily ignored, issue related to knowledge management capabilities. Literature reviews conducted for this study defined knowledge management from diverse perspectives, namely, knowledge management as a work processes or activities (Carvalho & Ferreira, 2001; Marwick, 2001; Milam, 2005), as a technology infrastructure (Alavi & Leidner, 1999; Chinowsky & Carrillo, 2007; Hansen et al., 1999; Stata, 1989), and as organizational culture (De Long, 1997; Pauleen et al., 2007; Suresh, 2002). Knowledge management is complex, multidimensional, and process-oriented. It is difficult to define and measure, and is a holistic framework that includes infrastructure, procedures, culture, systems, structure, practices, and organizational functions (Alavi & Leidner, 2001; Choi & Lee, 2003; Gorelick & Tantawy-Monsou, 2005; Iftikhar, 2003). This study verified that knowledge management capabilities are deeply related to each other, and should be considered as a holistic framework, where knowledge infrastructure capability and knowledge process capability coexist. The appropriate knowledge management infrastructure can enhance an organization's ability to create, share, and exploit knowledge, but it is insufficient to improve knowledge management success (Khalifa & Liu, 2003; Zack, 1999). In Smith's (2006b) study, there was a high correlation between knowledge infrastructure and knowledge process capabilities (.89), which could support this notion. Since knowledge infrastructure capability or knowledge process

capability are bonded together, each capability alone might not promise successful knowledge management in the South Korean business environment. Zack (1999) mentioned that the appropriate knowledge management infrastructure can enhance an organizational ability to create and exploit knowledge, but it does not ensure that the organization is making the best investment of its resources or that it is managing the right knowledge in the right way. In the KOSPI 200 organizations, the improvement in knowledge infrastructure capability could lead to strong and positive improvements in knowledge process capability. Vice versa, the facilitating knowledge process capability could lead to building a stronger knowledge-sharing culture, lowering the structural barriers inhibiting knowledge sharing processes, utilizing information technology, and facilitating the incentive system for sharing knowledge. This result provides strong evidence to support that knowledge management-related processes are restricted if there is no supportive knowledge management infrastructures, and conversely, that knowledge infrastructural investment is fruitless without appropriate knowledge management-related processes. However, this result could be limited to the large South Korean organizations; therefore, follow-up studies are required to prove the positive relationship between knowledge infrastructure and knowledge process capabilities.

This study found no evidence that knowledge management capabilities were associated with the objective financial variable of organizational performance, obtained by calculating Tobin's *q* (Table 39). Since the basic equation for Tobin's *q* is: stock market value/net worth of the corporation, it is sensitive to the market and the organization's asset value. In 2009, the world economy faced a huge economic crisis, and the South Korean economy was impacted as well. The economic growth rate was -4.5% in the first quarter of 2009, and the average economy growth rate was 0.2% in 2009, a considerable decrease from 5.1% in 2007 and 2.3% in 2008

(CIA, 2010; IMF, 2010). Moreover, the market value of KOSPI 200 organizations decreased. According to KRX (n.d.), the average stock price of KOPSI 200 was approximately $78 in 2009, whereas it was $82 in 2008 and $91 in 2007. However, the total asset of KOSPI 200 organizations in 2009 increased about 6.1% compared to 2008, because liabilities increased. However, it is unknown if the Tobin's *q* results of this study would be temporal or continuous phenomenon. Tobin's *q* fluctuates and is best measured over a fixed period of time (Henwood, 1998). In this sense, Tobin's *q*, which was used for the archival financial data, would be inappropriate.

This highlights the fact that it is difficult to find a direct correlation between knowledge management and the Tobin's *q*. Tobin's *q* is a good financial performance indicator that could measure intangible assets (Wu, 2008). However, no statistical evidence was found that knowledge management capabilities could improve the objective financial aspect of organizational performance. Additional research would be beneficial to identify the relationship between knowledge management capabilities and the objective financial performance by measuring the archival data periodically or using other financial measurements.

Mean differences between the upper and lower 100 KOSPI 200 organizations.

In contemporary organizations, core knowledge activities, namely, creation, acquisition, sharing and distribution, and application, would not be easily accomplished in the absence of knowledge infrastructural supports (Buckman, 2004). Usually, the costs of developing and maintaining knowledge management infrastructures are high, and without the expenditure of time and effort to maintain a knowledge management system, it would fail to yield any outcomes (Choi & Lee, 2003). In general, larger organizations have an advantage over small and medium-sized organizations in manpower, management resources, and innovative activities. In the larger

organizations, the distance among departments or subsidiaries was more remote than in smaller ones, and they require more sophisticated and communicative knowledge management infrastructures and processes to reduce those gaps. In many cases, small organizations have insufficient money and manpower to build a complex knowledge management infrastructure to support knowledge management (Suresh & Mahesh, 2006). Larger organizations are required to implement knowledge management to manage large-scale manpower and resources, and have the resources to do so. Consequently, larger organizations have the potential to reap the greatest benefits from knowledge management (KPMG, 1998). However, there has been little empirical study to identify the differences in knowledge management capabilities based on organizational size.

Within the KOSPI 200, the upper and lower 100 organizations differ in size and business scales. The upper organizations occupy 96.4% of the total market value of the KOSPI 200. In general, the larger organizations surpass the lower ones size, resources, and manpower. In this study, 78 organizations belonged to the top 100 organizations, and occupied 86.7% of the total market value, while 42 organizations belonged to the lower 100 organizations, and occupied only 1.8% of the total market value. In view of the significant differences, this study attempted to identify the mean differences between the upper and lower 100 KOSPI 200 organizations.

The results showed that there are significant group differences in knowledge management capabilities, except acquisition (Table 40). The upper 100 KOSPI 200 organizations invest more in building knowledge management infrastructures and facilitating knowledge management processes than do the lower organizations. Moreover, the results showed that more knowledge management capabilities could lead to more organizational performance in the customer-related and internal business aspects. This result implies that more efforts on improving knowledge

management capabilities could lead to positive outcomes in relationships with customers and internal business processes. Additionally, even though learning & growth and perceptual financial aspects of organizational performance were not statistically significant, the mean scores of the upper organizations were higher than those of the lower 100 KOSPI 200. This result provides good evidence for organizations that are considering investing more in knowledge management capabilities to improve organizational performance.

However, there was no mean difference in the acquisition process between the upper and lower 100 organizations. Overall, the organizations of the KOSPI 200 were diligent in acquiring knowledge from their customers, suppliers, and, where possible, competitors, as well as generating new knowledge, regardless of their size. Although the large and small organizations were similar in their objectives to acquire knowledge, the differences were in how they managed that knowledge. Follow-up studies are recommended for further generalizations.

Mean differences between manufacturing and nonmanufacturing KOPSI 200 organizations.

The KOSPI 200 consisted of 142 manufacturing and 58 nonmanufacturing organizations. The main differences between the manufacturing and nonmanufacturing organizations depended on whether they were involved in the production of goods or services. Although manufacturing and nonmanufacturing organizations might differ in organizational structure, process, and culture, this study identified that no group differences existed in knowledge management capabilities (Table 42).

More recently, the distinction is decreasing between manufacturing and nonmanufacturing organizations in South Korea. The tendency is for manufacturing organizations within the KOSPI 200 to focus not only on manufacturing products, but also to

have various operational departments which act the part of nonmanufacturing organizations. For example, one major electronics company has production factories, and also supports customer service, HR, finance, and marketing departments. In this context, identifying group differences between departments could be more meaningful, rather than basing comparisons strictly on the manufacturing or nonmanufacturing aspects. However, this study was not designed to identify the differences between functioning departments. The survey question regarding participants' departments was open-ended, and it was difficult to classify responses because many organizations use different department names even though they provide the same function. A follow-up study designed to isolate group differences among departments should include preset multiple choice items for participants to choose from.

General Limitations of the Study

Although this study offers contributions to the field of knowledge management, there are some important limitations. First, common method bias could be caused by the use of the self-report measure (Donaldson & Grant-Vallone, 2002). In general, common method bias occurs when the same method is used to measure correlations between variables (Schwarz, et al., 2008). When participants respond to both independent and dependent survey items, there is a possibility that independent and dependent variables are correlated. This study might not be free from common method bias to some degrees. It would be better to divide participants into two groups to respond to either the knowledge management capabilities survey or the organizational performance survey, and to investigate the correlation between them. Doing so would help to minimize the common method bias.

Second, there might be sampling bias. Specifically, inaccuracies in inferences about the population may exist because this study took a sample rather than researched the entire population. Sampling bias is often defined as "the difference between the sample result and the population characteristic being estimated" (Everitt & Skrondal, 2010, p. 377). The best remedies for controlling the sample bias would be adopting the random sampling procedure and recruiting as many samples as possible from the population, and defining the population as specifically as possible (Cochran, 1977). However, this study did not adopt a random sampling procedure; rather, a convenient sampling procedure was used by sending the invitation emails with the online survey link to contactable middle managers. Therefore, the issue of nonresponse bias may exist. In this study, the organizational level data was used if two or more employees completed the survey, even if the majority of middle managers in a KOSPI 200 organization did not participate. Additionally, this study did not define participants' department. The researcher believed that anyone in the organization can be an informant of knowledge management, so there was no restriction in defining participants' departments. This also might increase the nonresponse bias, because, in some organizations, participants from only one or two departments participated. In order to reduce the sampling and nonresponse bias, it would be the best to define and specify the participants' departments, which are more influenced by knowledge management capabilities. When knowledge management-dependent departments are identified, narrowing down the population is recommended to reduce the sampling and nonresponse biases.

Third, in this study, the instruments basically consist of two parts: knowledge management capabilities and organizational performance. However, both instruments were originally written in English, and needed to be translated into Korean. In many cases, meanings of survey items can be distorted due to a poor translation process. To secure the original meaning

of the instruments, this study adopted the back translation procedure. Although all efforts were made to secure the original meaning, there were subtle meaning differences, and some of them may have confused the participants. Moreover, the original number of survey items was too large, 134 items, including general information, knowledge management capabilities, and organizational performance, for busy middle managers, and may be the cause of a lower than expected response rate. The original instrument should be reduced through the appropriate statistical item reducing procedures (Figure 7). Basically, survey items were removed based on scores of Cronbach's α, which measures 'corrected item-total correlation' and communalities, and Exploratory Factor Analysis (EFA). In results, the number of items was reduced from 134 to 76 items. However, this process could result in another limitation of the study. It is questionable whether the subtle meaning differences in the survey items could cause participants to confuse the original meaning, and could result in a distortion of the statistical results of the item reducing process. Thereafter, the distortion of the statistical results could cause the meaningful items to be omitted. Additionally, the item reducing procedure was conducted in the pilot study, with fewer participants than in the original study. In the pilot study, 116 South Korean middle managers participated. The small number of participants could distort the statistical results. The best remedy for this phenomenon would be to reconduct the survey with the original instrument, with more participants. However, this requires more money, time, and effort.

Lastly, the KOSPI 200 organizations are relatively large in size. As mentioned previously, larger organizations often have an advantage over small and medium-sized organizations in manpower, management resources, and innovative activities, and require implementing knowledge management to manage large-scale manpower and resources. For this reason, it is possible that the relationships between knowledge management capabilities and organizational

performance that were observed in this study were limited to relatively large firms in South Korea.

Contributions to New Knowledge in HRD

The valuation of knowledge management capabilities is strategic to HRD professionals and practitioners to manage valuable organizational knowledge. Although there is a growing focus on knowledge management, it is hard to find a stable set of core concepts and practical applications. This study contributed to new knowledge in HRD by identifying that eight knowledge management capabilities are crucial factors in the improvement of organizational performance in the South Korean business environment.

One of the main paradigms of HRD is learning (Swanson & Holton, 2001). Watkins (2003) mentioned that "HRD is the field of study and practice responsible for the fostering of a long-term work-related learning capacity at the individual, group, and organizational level of organizations" (p.2). In general, knowledge is the foundation of learning, and learning is the process that supports acquiring or creating knowledge (Allee, 1999). Knowledge has become one of the most critical assets for survival in contemporary organizations, and no organization can assure success in the future based solely on what they know today. Organizations must find ways to understand and forecast their surrounding business world. Organizational learning is considered the most feasible solution for survival in today’s chaotic business environment, and the ability to learn faster than competitors provides a unique sustainable competitive advantage for the future (De Geus, 1997; Stata, 1989).

One of the most urgent challenges in the field of organizational learning is to discover new management tools and methods to accelerate organizational learning, to build consensus for

change, and to facilitate the change process. Human resource managers are interested in controlling learning processes in active and direct ways (Büchel & Probst, 2000; Stata, 1989). However, it is impossible to understand fully what is actually going on in complex organizations with limited human cognitive capabilities and memory. Many organizational learning and knowledge management scholars and practitioners have agreed that connecting knowledge management to organizational learning would be the best way to overcome the limitations of human cognitive abilities and memory, as well as to improve operational efficiency, effectiveness, and organizational productivity, and to establish a cornerstone to become a learning organization, which can lead to strategic benefits (Jones, 2001; Law & Ngai, 2008; Sher & Lee, 2004; Stata, 1989).

Since organizational learning consists of changes in the organization's knowledge bases and growth in the organization's competence to act and solve problems (Büchel & Probst, 2000), organizational learning should be supported by knowledge management capabilities. For example, information technology could facilitate organizational learning by bringing people together to maximize their individual and organizational knowledge (Jones, 2001), and this is one major capability of knowledge management. Teece (1986) mentioned that some organizational assets, infrastructures, or capabilities should be bundled together to support the successful commercialization and marketing of innovation, called 'complementary assets.' Often, complementary assets include distribution channels, sales and marketing expertise, manufacturing facilities, information technology infrastructure, customer support, etc. in the business world. However, this study borrowed the basic concept of complementary assets. In this study, complementary assests refer to any capabilities, processes, and infrastructures which help organizations to be innovative, productive, and competitive. This study found that in order to

improve organizational performance, it is critically important that the eight knowledge management capabilities work as complementary assets (Table 28).

Knowledge management involves innovative practices for supporting learning processes by reusing prior experience of other people and the organization, or by devising totally new approaches and practices, which can lead to better organizational performance (Law & Ngai, 2008). The primary focus for HRD practitioners relating to knowledge management is to implement knowledge management and organizational learning approaches accordingly. In order for knowledge management to be effective from the organizational learning perspective, Sanchez (2005) contended that an organization should be able to maintain learning loops in all of its processes, systematically disseminate new and existing knowledge throughout the organization, and apply knowledge in daily use. In addition, organizational learning and knowledge management are both inherently collaborative. The main challenge of recent organizations is how to combine knowledge management and organizational learning practices to maximize business performance.

Recommendations for future research

The results of this study suggest that there is a positive significant relationship between knowledge management capabilities and organizational performance. However, there are several unexplored questions to be answered.

First, this study was not designed to distinguish the differences between tacit and explicit knowledge. Tacit knowledge is difficult to articulate in formal language and transfer to others in terms of subjective insight, intuitions, and hunches; whereas, explicit knowledge is codified and can be easily transmitted to others – often called information (Buckman, 2004; Frappaolo, 2006;

Nonaka, 1994). Organizational knowledge usually implies both explicit and tacit knowledge. The role of knowledge managers is to activate and leverage the mixture of both forms so that they are available as an organizational asset (Carrillo, Robinson, Anumba, & Al-Ghassani, 2003). Both forms of knowledge are valuable to the organization, but tacit knowledge is more difficult to capture because it resides within individuals. Since tacit and explicit knowledge are different, how to manage them should be differentiated. Knowledge management should be categorized according to two states of knowledge; the first focuses on explicit knowledge, that is, which assists to create, store, share, and use explicitly codified knowledge, and; the second focuses on tacit knowledge, which emphasizes knowledge sharing by interpersonal interaction (Choi & Lee, 2003; Hansen, Nohria, & Tierney, 1999; Zack, 1999). However, this study did not deal with the two dimensions of knowledge. Identifying how knowledge management is involved in the processes of managing tacit and explicit knowledge would be a topic for further investigation.

Second, this study showed that there is a strong positive correlation between knowledge infrastructure and knowledge process capabilities. Successful knowledge management should require both knowledge management infrastructures and knowledge-related processes. Investing only in knowledge management infrastructures is insufficient to improve organizational performance, but knowledge infrastructures should be fully mediated through adequate knowledge management processes (Zack, 1999). On the other hand, it is difficult to implement knowledge management without any technological infrastructures, which should be the enabler of knowledge management processes (Khalifa & Liu, 2003). This fact could be an important issue for an organization that wants to invest in knowledge management initially. It is obvious that there is a connection between knowledge infrastructure and knowledge process capabilities, but it is questionable how they are related each other, and to what extent the organization must

balance them. Moreover, it is unknown whether the knowledge infrastructure capability triggers knowledge process capability or vice versa. Follow-up studies may identify the specific relationship between them.

Third, there must be hidden variables between knowledge management capabilities and organizational performance. Knowledge management is critical in today's global economy, but the results of knowledge management cannot be easily quantified in financial terms, because it often implemented informally. Therefore, there must be mediating variables between knowledge management capabilities and organizational performance. For example, Hsu (2008) assumed that knowledge management practices do not directly connect with organizational performance; instead, organizational performance is improved through an improvement of intermediate outcomes, such as human capital. The researcher believes that if knowledge management capabilities do not lead to knowledge sharing and creating processes, the role of knowledge management could degrade to a information repository. Knowledge management capabilities must facilitate knowledge sharing and creating processes, resulting in improved organizational performance indicators, such as the customer-related, internal business, and learning & growth aspects. Finally, those leading organizational performance indicators could improve lagging organizational performance and the financial aspect. Figure 11 explains the researcher's recommended model.

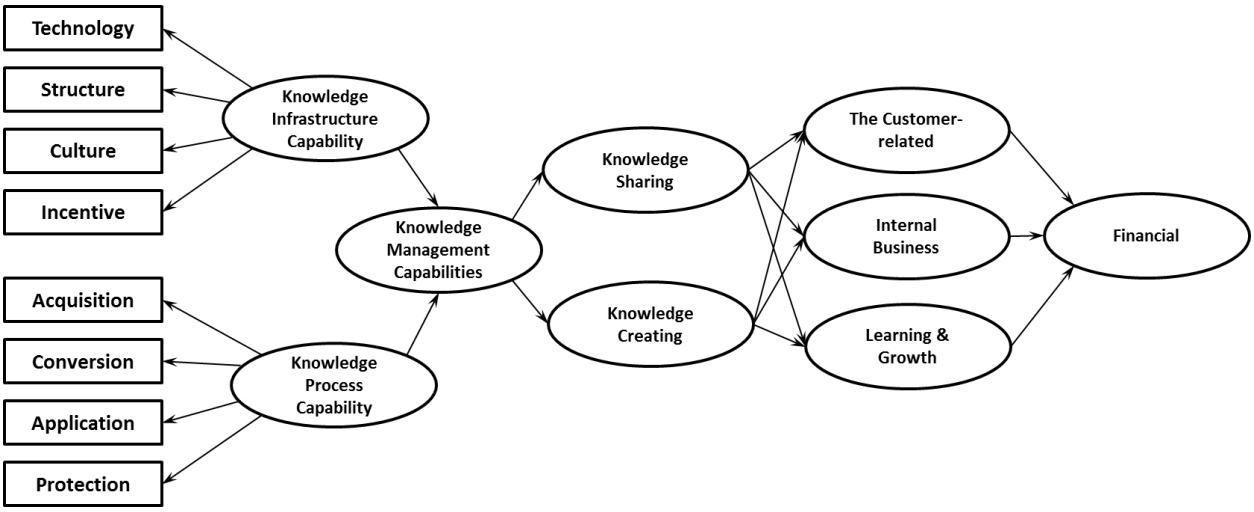

Figure 11. The Recommended Model of Knowledge Management Capabilities and Organizational Performance.

Although one purpose of the study was to identify the direct relationship between knowledge management capabilities and organizational performance, there might be some hidden variables between them.

Moreover, this study found that there are mean differences between the upper and lower 100 KOSPI 200 organizations. It showed that larger organizations in South Korea have more knowledge management capabilities than do smaller ones. If this fact is true, the investment in knowledge infrastructure and process capabilities can be a determining factor for a successful knowledge management project. More empirical studies are required to identify the relationship between the degree of investment in knowledge management and organizational performance. This issue provides good evidence for an organization that plans to invest more in knowledge management.

Conclusion

Knowledge is an important asset for an organization's future prosperity. Possessing more knowledge about customers, products, technologies, markets, and competitors means creating more possibilities for sustainable competitive advantages. Contemporary organizations must be able to capture, share, use, and create valuable knowledge for the purpose of achieving objectives. Knowledge management has been considered as the most feasible solution for handling knowledge. Effective knowledge management is essential to the success of contemporary organizations, and has been applied across the world, in all industry sectors, in public and private organizations. However, fundamentally, it remains unclear what elements compose knowledge management, and the link between knowledge management and organizational performance is often not strong enough to convince organizations to invest in knowledge management. A stable set of core concepts and practical applications remains an area for which many questions still exist regarding knowledge management.

This study confirmed that knowledge management capabilities consist of knowledge infrastructure and knowledge process capabilities. However, knowledge infrastructure and knowledge process capabilities are highly correlated with each other, which could imply that knowledge management should be implemented holistically and balanced without overemphasis on either one. This study also confirmed that knowledge infrastructure capability consists of technology, structure, culture, and incentive, whereas knowledge process capability includes acquisition, conversion, application, and protection. Moreover, this study showed that organizational performance consists of the four aspects of the Balanced Scorecard: customer-related, internal business process, learning & growth, and financial performance.

The main purpose of the study was to identify the relationship between knowledge management capabilities and organizational performance. This study found that there is a strong positive relationship between overall knowledge management capabilities, including the eight capabilities variables and four organizational performance variables specified in the Balanced Scorecard concept, in the KOSPI 200 organizations. This study supports the conclusion that investing in knowledge management capabilities improves organizational performance. Moreover, knowledge management capabilities are positively correlated with each other, and each knowledge management capability could explain the four aspects of organizational performance, which indicates that the eight knowledge management capabilities must be taken into account when implementing knowledge management systematically. However, the more specific and detailed relationships between knowledge management capabilities and organizational performance should be investigated through future studies.

In addition, this study found that there are mean differences between the upper and lower 100 KOSPI 200 organizations, but found no mean differences between manufacturing and nonmanufacturing organizations. The upper 100 KOSPI organizations, which are larger than the lower 100, have more knowledge management capabilities, and can more readily achieve positive outcomes in organizational performance with customers and the internal business environment.

Although there are some limitations within this study, it is obvious from the results that this study is valuable in establishing a valid and reliable survey instrument, provides strong evidence that knowledge management capabilities could produce improvement in organizational performance, and makes important recommendations for future research.

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Appendix A

The Korean Translated Instrument

일반적 정보

변인 명	항목
G1	당신회사의 이름은 무엇입니까?
G2	당신은 조직에서 어떤 부서에 소속되어 있습니까?
G3	당신의 연령대는 어떻게 되십니까?
G4	당신의 성별은 무엇입니까?
G5	당신은 어떤 직책을 맡고 계십니까?
G6	현재의 회사에서 근무한 기간은 얼마입니까?
G7	현재 부서에서 일하기 전에 다른 부서에서 근무한 적이 있나요? 만약 그렇다면 상세하게 기술해 주세요..

테크놀로지 (technology)

변인 명	항목
우리 조직은	
TI1	우리 조직은 상품 정보를 구성하거나 분류하는데 필요한 명확한 규정을 가지고 있습니다.
TI2	우리 조직은 절차에 관한 정보/지식 (process knowledge)을 구성하거나 분류하는데 필요한 명확한 규정을 가지고 있습니다.
TI3	우리 조직은 비스니스 파트너들과 경쟁사의 정보를 모니터링 할 수 있는 테크놀로지를 가지고 있습니다.
TI4	우리 조직은업무에 있어 동료들과 협력할 수 있도록 도와주는 테크놀로지를 가지고 있습니다.
TI5	우리 조직은 외부직원들과 협력할 수 있도록 도와주는 테크놀로지를 가지고 있습니다.
TI6	우리 조직은 여러 지역의 직원들이 하나의 정보/지식의 원천으로 부터 교육을 받을 수 있는 원격 교육 테크놀로지를 가지고 있습니다.
TI7	우리 조직은 여러 지역의 직원들이 다양한 정보/지식의 원천으로 부터 교육을 받을 수 있는 원격 교육 테크놀로지를 가지고 있습니다.
TI8	우리 조직은 새로운 지식과 정보를 습득할 수 있도록 도와주는 테크놀로지를 가지고 있습니다.
TI9	우리 조직은 필요한 지식이나 정보의 위치 (예, 특정 전문가, 시스템 혹은 데이터 베이스) 를 알려주는 테크놀로지를 가지고 있습니다. (Knowledge Map)

변인 명	항목
TI10	우리 조직은 우리 회사 제품 혹은 프로세스에 관한 필요한 지식이나 정보를 열람/검색/사용 할수 있도록 도와주는 테크놀로지를 가지고 있습니다.
TI11	우리 조직은 시장 혹은 경쟁 회사의 정보를 열람/검색/사용 할 수 있도록 도와주는 테크놀로지를 가지고 있습니다.
TI12	우리 조직은 비즈니스 파트너와 새로운 비즈니스를 물색할 수 있도록 도와주는 테크놀로지를 가지고 있습니다.

조직 구조 (Structure)

변인 명	항목
SI1	회사의 조직 구성이 지식/정보 교류를 방해 합니다
SI2	회사의 조직 구성이 개인적인 행동보다는 집단적인 행동을 장려합니다.
SI3	회사의 조직 구성이 새로운 지식의 발견을 촉진합니다.
SI4	회사의 조직 구성이 새로운 지식을 창출할 수 있도록 도와줍니다.
SI5	우리의 업무 성과는 새로운 지식 창조를 지향합니다.
SI6	회사의 조직 구성은 부서간의 지식 교류를 용이하게 이루어질수 있도록 구성되어 있습니다.
SI7	우리 조직은많은 회사들과 전략적인 협력 관계를 맺고 있습니다.
SI8	우리 조직은 직원들의 실수나 에러에 대해 전문가의 자문을 구하도록 권장한다.
SI9	우리 조직의 관리자들은 직원들이 실수나 에러에 대한 지식/정보를 얼마나 갖추고 있는지 자주 확인한다.
SI10	회사의 조직 구조는 부서간의 새로운 지식 공유을 촉진합니다.
SI11	직원들끼리 쉽게 접근할 수 있다. (서로의 접근성이 뛰어나다)

문화 (Culture)

변인 명	항목
CI1	우리 조직의 직원들은 지식의 중요성을 인지하고 있습니다.
CI2	지식을 습득하고 이전하는데 직원들은 높은 참여도를 보이고 있습니다.
CI3	우리 조직의 직원들은 새로운것을 탐구하고 실험하도록 권장되어집니다.
CI4	우리 조직은 직업훈련 (On-the-job training)과 교육을 중요시 합니다.
CI5	우리 조직은 직원들의 개별 전문성을중요시 합니다.
CI6	우리 조직은 직원들이필요하면 다른 사람에게도움을 청할수 있도록 권장합니다.

변인 명	항목
CI7	우리 조직은 직원들이 다른 그룹과 상호 교류하도록 권장합니다.
CI8	우리 조직은 직원들이 자신의 일을 다른 업무 그룹의 사람들과 논의하도록 장려합니다.
CI9	우리 조직의 직원들은 조직의 비젼을 명확히 알고 있습니다.
CI10	우리 조직의 직원들은 조직의 목표를 명확히 알고 있습니다.
CI11	우리 조직은 다른 조직들과 지식을 공유합니다. (예, 비즈니스 파트너, 무역 그룹들)
CI12	우리 조직은 지식 공유의 이익이 그를 위해 소요되는 비용을 초과합니다.
CI13	우리 조직의 상급 관리자는 회사의 성공에 지식의 역할이 중요하다고 강조합니다.

인센티브 (Incentive)

변인 명	항목
우리 조직은	
II1	우리 조직은 아이디어를 회사에 제출하면 금전적 인센티브/보상을 해줍니다.
II2	우리 조직은 다른 직장 동료와 지식을 공유하는데에 대한 금전적 인센티브/보상을 해줍니다.
II3	우리 조직은 같은 그룹이나 팀 내에서 지식을 공유하는데에 대한 금전적 인센티브/보상을 해줍니다.
II4	우리 조직은 다른 그룹이나 팀간과 지식을 공유하는데에 대한 금전적 인센티브/보상을 해줍니다.
II5	우리 조직은 정보 저장소나 전자 데이터 베이스에 정보/지식을 기여하는 경우 금전적 인센티브/보상을 해줍니다.
II6	지식/정보를 공유하면 조직내 나의 평판이 올라갑니다.
II7	지식/정보 공유는 나의 이력에 도움이 됩니다.
II8	나의 상사나 동료는 내가 그들과 정보를 공유하면 나에게 칭찬을 합니다.
II9	좋은 지식 경영 행동들은 모니터링 되어지고 평가 시스템에 방영됩니다.
II10	나쁜 지식 행동들은 (지식 공유하지 않음, best practices 를 사용하지 않음) 적극적으로 만류됩니다.
II11	개인들의 팀워크, 지식 공유 그리고 지식의 재사용은 인식할 수 있는 보상을 받습니다.

습득 과정 (Acquisition)

변인 명	항목
우리 조직은	
AQP1	우리 고객에 대한 지식을 습득할 수 있게 하는 절차 (process)를 가지고 있습니다.
AQP2	우리 조직은 기존 지식으로 부터 새로운 지식을 창출해 내도록 하는 절차 (process)가 있습니다.
AQP3	우리 조직은 우리의 공급자(제품/부품 제조업자, 원료 공급자 등)의 지식을 습득할 수 있도록 하는 절차 (process)가 있습니다.
AQP4	우리 조직은 현재 프로젝트의 피드백을 차후 프로젝트의 개선을 위하여 사용합니다.
AQP5	우리 조직은 조직 전체에 정보/지식을 공지하는절차 (process)가 있습니다.
AQP6	우리 조직은 사업 파트너들과 정보/지식을 공유하는절차 (process)를 가지고 있습니다.
AQP7	우리 조직내에 협업 (協業)에 관한 프로세스를 가지고 있습니다.
AQP8	우리 조직은 업계 내의 새로운 상품이나 서비스에 대한 정보를 습득할 수 있는 절차 (process)가 있습니다.
AQP9	우리 조직은 업계 내 경쟁자들에 대한 정보/지식을 습득할 수 있는 절차 (process)가 있습니다.
AQP10	우리 조직은 실적 (performance)를 표준화하는 절차 (process)가 있습니다.
AQP11	우리 조직은 업무에서 best practice 가 무엇이 있는지 알아보는 팀이 있습니다.
AQP12	우리 조직은 개인간의 정보/지식을 교환하는 절차 (process)가 있습니다.

변환 과정 (Conversion)

변인 명	항목
CP1	우리 조직은 습득한 정보를 새로운 상품이나 서비스를 고안하는데 사용하게하는 절차 (process)가 있습니다.
CP2	우리 조직은 경쟉력 있는 정보/지식을 행동 계획으로 바꾸도록 하는 절차 (process)가 있습니다.
CP3	우리 조직은 적절한 정보/지식을 걸러주는 (filtering) 절차 (process)가 있습니다.
CP4	우리 조직은 조직의 정보/지식을 개인에게 전해주는 절차 (process)가 있습니다.
CP5	우리 조직은 개인의 정보/지식을 조직의 정보/지식으로 흡수하는 절차 (process)가 있습니다.
CP6	우리 조직은 비즈니스 파트너의 정보/지식을 우리 조직의 정보/지식으로

변인 명	항목
	흡수시키는 절차 (process)가 있습니다.
CP7	우리 조직은 전사에 정보/지식을 알려주는 절차 (process)가 있습니다.
CP8	우리 조직은 서로 다른 종류의 정보/지식과 소스 (source) 통합시키는 절차 (process)가 있습니다.
CP9	우리 조직은 정보/지식을 조직적으로 구성하는 절차 (process)가 있습니다.
CP10	우리 조직은 오래된 정보/지식을 새로운 정보/지식으로 업데이트 해주는 절차 (process)가 있습니다.

적용 과정 (Application)

변인 명	항목
APP1	우리 조직은 실수로 부터 습득한 정보/지식을 적용시키는 절차 (process)가 있습니다.
APP2	우리 조직은 경험으로 부터 습득한 정보/지식을 적용시키는 절차 (process)가 있습니다.
APP3	우리 조직은 정보/지식을 새로운 상품이나 서비스 개발에 사용시키는 절차 (process)가 있습니다.
APP4	우리 조직은 정보/지식을 새로운 문제 해결하는 데 사용시키는 절차 (process)가 있습니다.
APP5	우리 조직은 어떠한 문제나 과제에 적합한 정보/지식 소스를 찾아주는 절차 (process)가 있습니다.
APP6	우리 조직은 효율성을 향상시키는데 정보/지식을 적용합니다.
APP7	우리 조직은 전략적 방향을 조정하는데 정보/지식을 적용합니다.
APP8	우리 조직은 변화하는 경쟁 조건이 변화함에 따라 적절한 정보/지식을 적용합니다.
APP9	우리 조직은 정보/지식을 필요로하는 사람에게 정보/지식을 제공합니다.
APP10	우리 조직은 새로운 정보/지식으로 부터 편의/이익을 얻습니다..
APP11	우리 조직은 중요한 경쟁적 상황에 신속하게 필요한 정보/지식을 활용할 수 있습니다.
APP12	우리 조직은 문제의 빠른 해결을 위해 정보/지식의 소스를 찾아냅니다.

보호 과정 (Protection)

변인 명	항목
PP1	우리 조직은 조직 내에서 정보/지식이 부적절하게 사용되는 것을 방지하는 절차 (process)가 있습니다.
PP2	우리 조직은 조직 밖에서 정보/지식이 부적절하게 사용되는 것을 방지하는 절차 (process)가 있습니다.
PP3	우리 조직은 조직 내에서 정보/지식의 유출을 방지하는 절차 (process)가 있습니다.
PP4	우리 조직은 조직 밖으로 정보/지식이 유출되는 것을 방지하는 절차 (process)가 있습니다.
PP5	우리 조직은 정보/지식 보호를 장려하는 인센티브가 있습니다.
PP6	우리 조직은 특정 정보/지식에 접근을 제한시킬 수 있는 테크놀로지(software, hardware)가 있습니다.
PP7	우리 조직은 무역 기밀 누출을 방지하는 정책과 절차를 가지고 있습니다.
PP8	우리 조직은 개인들이 가진 정보를 귀하게 여기고 보호해 준다.
PP9	우리 조직은 정보/지식 제한의 기준이 명확합니다.
PP10	우리 조직은 정보/지식 보호의 중요성에 대하여 명백히 알려줍니다.

소비자 관점 (Customer-related Aspect)

변인 명	항목
CR1	우리가 제공하는 서비스나 상품의 질이 향상되었습니다.
CR2	우리가 제공하는 서비스나 상품의 수가 증가되었습니다.
CR3	우리가 제공하는 서비스나 상품의 종류가 증가하였습니다.
CR4	우리의 서비스나 상품을 사용하는 사람의 수가 증가하였습니다.
CR5	우리가 제공하는 서비스나 상품에 대한 수요가 증가하였습니다.
CR6	우리가 제공하는 서비스나 상품의 평균 가격은 우리의 주요 경쟁사들의 가격보다 낮습니다.
CR7	우리의 서비스나 상품은 시장에서 선두를 달리고 있습니다.
CR8	우리의 형편없는 서비스나 상품 때문에 소비자들이 떠나고 있습니다.
CR9	우리 조직은 고객의 기대를 끊임없이 충족시켜주고 있습니다.
CR10	우리 조직은 고개이 원하는 서비스나 상품이 무엇인지를 알기 위한 조치를 취하고 있습니다.
CR11	우리 조직은 좋은 서비스나 상품으로 좋은 명성을 확립했습니다.
CR12	우리 조직은 혁신적이고 특별한 기능의 서비스나 상품을 우리의 주요 경쟁사보다 더 자주 선보입니다.

내부적 관점 (Internal Business Process Aspect)

변인 명	항목
IB1	우리 조직은 기획 절차를 개선해 왔습니다.
IB2	우리 조직은 품질 관리 절차를 개선해 왔습니다.
IB3	우리 조직은 서비스 혹은 제품의 배송 절차를 개선해 왔습니다.
IB4	우리 조직은 소비자 만족을 증가시키기 위한 정책과 절차 (process)를 개발해 왔습니다.
IB5	우리 조직은 서비스 혹은 상품의 품질 프로토콜을 일관성 있게 따릅니다.
IB7	우리 조직은 주요 경쟁사들보다 더 효율적인 서비스 혹은 상품의 연구 개발 주기 (기획에서 최종 서비스 혹은 상품까지 만들어 지는 주기)를 갖고 있습니다.
IB8	우리 조직은 주요 경쟁사들보다 더 많은 소비자 불만이 들어옵니다.
IB9	우리 조직은 주요 경재사들보다 연구 개발 (R&D)에 더 많은 자금을 투자합니다.
IB10	우리 조직은 브랜드 인지도를 높이기 위해 끊임없이 노력합니다.
IB11	우리 조직의 사업 기획은 조직의 목표에 의거하여 작성됩니다.
IB12	우리 조직 관리는 우리의 미션을 이루는데 도움이 됩니다.

직원 교육과 성장 (Learning & Growth Aspect)

변인 명	항목
LG1	나의 업무는 조직의 미션과 직접적으로 연관되어 있습니다.
LG2	나는 내 업무에 만족합니다.
LG3	나의 업무는 지루합니다.
LG4	나의 업무는 나에게 성취감을 줍니다.
LG5	나는 내 업무를 수행하기 위한 핵심적인 능력이 부족합니다.
LG6	우리 조직은 내가 업무를 수행하는데 필요한 정부를 충분히 제공합니다.
LG7	우리 조직은 내가 실적 목표를 달성하기 위해 최적의 결정을 하기 위한 충분한 정보를 제공합니다.
LG8	나는 명확한 실적 목표를 가지고 있습니다.
LG9	나는 업무에 있어 매우 생산적입니다.
LG10	우리 조직은 내가 업무를 수행하는데 필요한 교육을 실시합니다.
LG11	우리 조직은 조직의 목적과 목표에 맞는 교육을 실시합니다.
LG12	우리 조직은 나의 실적 목표를 달성하기 위해 필요한 장비나 도구를 제공합니다.

Appendix B

Result of Exploratory Factor Analysis

Knowledge Infrastructure Capability

Item-Total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
TI1	180.07	599.725	.464	.945
TI2	180.24	592.343	.635	.944
TI3	180.73	600.458	.490	.945
TI4	180.35	596.189	.605	.945
TI5	180.86	600.221	.481	.945
TI6	179.79	601.386	.420	.946
TI7	180.29	590.587	.558	.945
TI8	180.36	586.752	.723	.944
TI9	180.38	587.497	.719	.944
TI10	180.22	594.132	.608	.944
TI11	180.98	600.440	.483	.945
TI12	180.95	595.948	.578	.945
SI1R	180.52	600.912	.443	.945
SI2	180.71	620.907	.031	.948
SI3	180.65	592.229	.731	.944
SI4	180.68	594.119	.693	.944
SI5	180.39	588.919	.714	.944
SI6	180.93	592.645	.669	.944
SI7	180.28	604.082	.403	.946
SI8	180.92	585.754	.682	.944
SI9	181.00	594.540	.586	.945
SI10	180.72	593.282	.604	.944
SI11	180.47	597.271	.533	.945
CI1	180.09	597.682	.611	.945
CI2	180.42	587.065	.738	.944
CI3	180.64	591.772	.636	.944
CI4	180.02	598.780	.531	.945
CI5	180.12	597.666	.478	.945
CI6	180.09	596.462	.623	.944
CI7	180.35	600.189	.519	.945
CI8	180.47	598.411	.554	.945
CI9	179.95	596.448	.581	.945

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
CI10	179.84	596.815	.602	.945
CI11	180.61	601.939	.493	.945
CI12	180.85	603.328	.404	.946
CI13	180.12	602.686	.455	.945
II1	181.02	605.920	.255	.947
II2	181.82	603.788	.318	.946
II3	181.84	601.535	.371	.946
II4	181.88	604.406	.320	.946
II5	181.67	600.802	.326	.947
II6	180.76	601.183	.507	.945
II7	181.01	595.510	.584	.945
II8	180.56	604.228	.434	.945
II9	181.12	601.026	.443	.945
II10	180.78	613.472	.183	.947
II11	181.44	597.068	.513	.945

Note. Highlighted = deleted.

Communalities

Item	Initial	Extraction
TI1	.726	.704
TI2	.802	.738
TI3	.637	.534
TI4	.757	.621
TI5	.713	.688
TI6	.679	.565
TI7	.753	.604
TI8	.866	.781
TI9	.913	.783
TI10	.849	.687
TI11	.707	.633
TI12	.747	.678
SI1R	.623	.430
SI2	.566	.250
SI3	.825	.642
SI4	.852	.600
SI5	.801	.670
SI6	.836	.742
SI7	.560	.347
SI8	.833	.665

Item	Initial	Extraction
SI9	.788	.723
SI10	.807	.639
SI11	.700	.555
CI1	.801	.583
CI2	.838	.727
CI3	.798	.826
CI4	.692	.468
CI5	.706	.549
CI6	.824	.672
CI7	.734	.524
CI8	.773	.700
CI9	.811	.776
CI10	.865	.908
CI11	.652	.413
CI12	.619	.419
CI13	.708	.497
II1	.711	.535
II2	.888	.864
II3	.923	.894
II4	.958	.947
II5	.883	.829
II6	.714	.584
II7	.756	.716
II8	.676	.710
II9	.674	.545
II10	.594	.324
II11	.815	.706

Note. Highlighted = deleted.

Pattern Matrix

Item	Factor			
	1	2	3	4
CI7	**.838**	-.069	.227	-.071
CI10	**.791**	-.017	-.082	.130
CI6	**.743**	-.111	.041	-.142
CI9	**.742**	-.018	-.109	.140
CI11	**.719**	.037	.064	.039
CI8	**.719**	.060	.065	-.074
CI2	**.664**	-.024	-.058	-.190
CI12	**.549**	.067	-.073	.142
II4	-.019	**1.010**	.096	.034
II3	-.024	**.967**	.045	.002
II2	.042	**.938**	-.040	.185
II5	-.075	**.894**	-.043	.048
II11	.087	**.589**	.132	-.324
TI10	-.065	-.090	**-.913**	-.027
TI9	-.162	.061	**-.887**	-.176
TI6	.026	-.119	**-.772**	.130
TI8	.122	-.017	**-.751**	-.080
TI11	-.045	.184	**-.556**	-.023
TI7	.182	-.057	**-.473**	-.136
SI9	-.057	-.050	-.046	**-.862**
SI6	.076	.095	-.137	**-.656**
SI8	-.070	.049	-.253	**-.651**
SI10	.285	-.063	-.009	**-.577**

Knowledge process capability

Item-Total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
AP1	168.03	838.772	.629	.973
AP2	168.24	829.135	.771	.973
AP3	168.26	839.656	.631	.973
AP4	167.92	837.993	.691	.973
AP5	167.86	838.804	.659	.973
AP6	168.33	839.356	.653	.973
AP7	168.01	834.608	.756	.973
AP8	168.10	833.206	.768	.973
AP9	168.41	838.883	.631	.973
AP10	168.07	845.263	.497	.974
AP11	168.14	833.567	.555	.974
AP12	168.11	835.853	.638	.973
CP1	168.14	832.227	.774	.973
CP2	168.23	834.779	.740	.973
CP3	168.33	837.232	.687	.973
CP4	168.04	829.710	.762	.973
CP5	168.11	827.688	.821	.973
CP6	168.42	840.143	.641	.973
CP7	167.77	828.099	.772	.973
CP8	168.37	835.183	.656	.973
CP9	168.10	825.453	.847	.972
CP10	168.24	833.486	.677	.973
APP1	168.43	835.649	.638	.973
APP2	168.09	835.363	.675	.973
APP3	168.16	833.251	.712	.973
APP4	168.14	829.876	.810	.973
APP5	168.13	830.199	.807	.973
APP6	167.84	843.726	.638	.973
APP7	167.74	837.450	.678	.973
APP8	167.88	843.346	.602	.973
APP9	167.88	844.603	.585	.973
APP10	167.92	845.911	.583	.973
APP11	168.02	841.855	.687	.973
APP12	167.88	831.820	.786	.973
PP1	167.96	831.916	.648	.973
PP2	167.85	830.420	.622	.973
PP3	167.80	827.587	.618	.973
PP4	167.67	831.315	.588	.973

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PP5	168.77	835.625	.526	.974
PP6	167.61	828.900	.643	.973
PP7	167.57	829.794	.590	.973
PP8	168.02	820.948	.763	.973
PP9	167.61	834.054	.605	.973
PP10	167.60	833.747	.639	.973

Note. Highlighted = deleted.

Communalities

Item	Initial	Extraction
AP1	.811	.442
AP2	.868	.658
AP3	.796	.555
AP4	.790	.567
AP5	.781	.548
AP6	.793	.557
AP7	.830	.615
AP8	.812	.644
AP9	.817	.596
AP10	.688	.334
AP11	.733	.412
AP12	.793	.508
CP1	.843	.658
CP2	.844	.612
CP3	.796	.539
CP4	.885	.680
CP5	.874	.738
CP6	.812	.513
CP7	.841	.742
CP8	.768	.590
CP9	.850	.773
CP10	.813	.540
APP1	.836	.698
APP2	.833	.547
APP3	.770	.560
APP4	.853	.719
APP5	.870	.678
APP6	.820	.692
APP7	.880	.792
APP8	.843	.693
APP9	.760	.636

Item	Initial	Extraction
APP10	.757	.551
APP11	.783	.646
APP12	.886	.767
PP1	.838	.563
PP2	.814	.609
PP3	.852	.697
PP4	.882	.689
PP5	.647	.301
PP6	.878	.762
PP7	.871	.693
PP8	.842	.656
PP9	.800	.610
PP10	.812	.673

Note. Highlighted = deleted.

Pattern Matrix

Item	Factor			
	1	2	3	4
CP3	**1.023**	-.102	-.077	-.174
CP5	**.873**	.118	.007	-.138
CP2	**.834**	-.093	.042	.009
CP8	**.825**	-.042	-.172	.068
CP4	**.813**	.081	-.002	-.093
CP9	**.778**	.095	-.038	.082
APP2	**.769**	-.062	-.006	.012
CP1	**.699**	-.049	.097	.137
APP5	**.654**	.134	.134	-.023
APP3	**.613**	-.059	.164	.090
APP4	**.602**	.087	.099	.133
PP7	-.121	**.929**	-.026	-.043
PP6	-.140	**.885**	.095	-.047
PP2	-.170	**.869**	-.060	.176
PP10	.039	**.816**	.128	-.210
PP9	.080	**.800**	-.036	-.130
PP3	.185	**.726**	-.203	-.010
PP1	.126	**.662**	-.103	.121
APP6	-.063	-.025	**.980**	-.086
APP7	-.042	-.018	**.954**	-.026
APP8	.003	-.104	**.922**	-.044
APP9	-.001	.009	**.650**	.056
AP1	-.145	.227	.017	**.826**
AP3	.101	-.086	.188	**.665**
AP9	.346	-.079	-.108	**.627**
AP2	.374	.051	.058	**.462**
AP10	.052	-.075	.294	**.400**

Organizational performance

Item-Total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
CR1	146.67	285.754	.706	.936
CR2	146.80	284.502	.652	.937
CR3	146.86	285.694	.613	.937
CR4	146.83	290.035	.475	.938
CR5	146.84	289.049	.566	.937
CR6	147.48	297.827	.127	.942
CR7	146.71	280.806	.681	.936
CR8R	146.89	294.329	.248	.941
CR9	147.03	283.052	.728	.936
CR10	146.78	284.706	.662	.937
CR11	146.66	283.417	.672	.936
CR12	147.25	281.999	.667	.936
IB1	146.95	287.433	.584	.937
IB2	146.48	286.955	.599	.937
IB3	146.67	290.009	.510	.938
IB4	146.55	286.527	.610	.937
IB5	146.77	288.542	.548	.938
IB6	147.16	285.751	.608	.937
IB7	147.16	285.262	.635	.937
IB8R	147.04	294.317	.270	.940
IB9	147.28	289.227	.410	.939
IB10	146.77	280.222	.690	.936
IB11	146.71	285.168	.614	.937
IB12	146.84	285.751	.626	.937
LG1	146.62	288.557	.564	.937
LG2	146.83	284.993	.621	.937
LG3R	146.91	296.299	.222	.941
LG4	146.92	289.418	.519	.938
LG5R	146.85	296.489	.198	.941
LG6	147.20	289.396	.546	.938
LG7	147.25	289.553	.553	.938
LG8	146.75	292.744	.372	.939
LG9	146.84	290.837	.474	.938
LG10	147.02	280.489	.700	.936
LG11	147.02	284.851	.646	.937

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
LG12	146.91	288.853	.582	.937

Note. Highlighted = deleted.

Communalities

Item	Initial	Extraction
CR1	.768	.586
CR2	.883	.873
CR3	.858	.817
CR4	.563	.542
CR5	.687	.618
CR6	.663	.481
CR7	.725	.710
CR8R	.598	.566
CR9	.759	.618
CR10	.727	.539
CR11	.775	.626
CR12	.870	.762
IB1	.700	.557
IB2	.744	.662
IB3	.849	.745
IB4	.845	.779
IB5	.719	.644
IB6	.752	.640
IB7	.756	.710
IB8R	.614	.630
IB9	.647	.330
IB10	.772	.690
IB11	.798	.742
IB12	.796	.822
LG1	.681	.616
LG2	.781	.714
LG3R	.596	.499
LG4	.688	.714
LG5R	.558	.464
LG6	.858	.929
LG7	.858	.775
LG8	.679	.588

Item	Initial	Extraction
LG9	.622	.643
LG10	.812	.836
LG11	.804	.637
LG12	.765	.617

Note. Highlighted = deleted.

Pattern Matrix

Item	Factor		
	1	2	3
LG7	**.853**	.092	-.195
LG6	**.773**	.172	-.172
LG10	**.743**	-.089	.218
LG12	**.738**	-.235	.200
LG11	**.617**	.061	.187
IB3	-.142	**-.891**	-.018
IB4	-.114	**-.878**	.076
IB2	-.041	**-.714**	.124
IB5	.116	**-.670**	-.113
IB11	.231	**-.506**	.048
IB12	.259	**-.424**	.166
CR5	.010	-.063	**.797**
CR4	-.134	.002	**.790**
CR2	.018	.216	**.594**
IB7	.193	.053	**.495**
CR12	.157	.135	**.454**